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Dr. Herbert Jones

PROCEEDINGS
OF THE
ROYAL SOCIETY OF MEDICINE

EDITED BY
JOHN NACHBAR, M.A., M.D.
UNDER THE DIRECTION OF
THE EDITORIAL COMMITTEE

VOLUME THE FIRST

SESSION 1907-8

PART I.

CLINICAL SECTION

ELECTRO-THERAPEUTICAL SECTION

DERMATOLOGICAL SECTION

EPIDEMIOLOGICAL SECTION



LONDON
LONGMANS, GREEN & CO., PATERNOSTER ROW
1908

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PROCEEDINGS
OF THE
ROYAL SOCIETY OF MEDICINE

VOLUME THE FIRST

COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE
SESSION 1907-8

CLINICAL SECTION



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The Council think it right to state that the Society does not hold itself in any way responsible for the statements made or the views put forward in the various papers.

Clinical Section.

October 11, 1907.

Sir THOMAS BARLOW, Bt., K.C.V.O., President of the Section, in the Chair.

PRESIDENTIAL ADDRESS.

AT this our first meeting I crave your indulgence while I endeavour to set forth some of the great services done for medicine by the Clinical Society of London, of which our section is the lineal representative. It is close upon forty years since the Society was founded. The draft rules were prepared by a committee consisting of Dr. Buchanan, Mr. Callender, Dr. Greenhow, Mr. Heath, Dr. Ringer, and Dr. Sanderson, and of these Dr. Ringer is the sole survivor. From its start the primary object of the Society was recognised as the record, investigation, and discussion of *individual* cases. It was resolutely concrete, and the aim was to make the bedside observation of disease as accurate, complete, and useful as possible, and, where feasible, subsequently to sift and verify the records in so far as they might be imperfect.

It is abundantly obvious that the founders of the Society were strongly opposed to academic discourses on general topics, and by the suggestion of ten minutes as the usual time to be allowed for a communication they indicated the necessity of keeping close to the case. The lines of the constitution were singularly uncongenial to medical advertisement and medical rhetoric. The rules even dictated, somewhat didactically, the order in which the various parts of a case should be given and subsequently considered.

While pondering over these regulations of forty years ago, one can fancy that behind them there emerges the embodied presence of some great hospital clinical teacher, who keeps his students close to the bedside, compelling the case ever to unfold itself under their investigation, then takes them to the *post-mortem* room for verification, and throughout all is absolutely intolerant of speculative nonsense and the *non-scientific* use of the imagination.

A special feature was to be the arrangement for small committees of one or more members to co-operate in investigation with the original contributor in the cases which were still incomplete. This practice was maintained for two or three years, but gradually receded into the background. It might be advantageous to resuscitate it. Authority was also given to the president to appoint larger committees for the conjoint investigation of clinical and therapeutical questions. Enormous advantage has accrued to medicine from the carrying out of this provision.

The first president of the Society was the venerable Sir Thomas Watson, and the first ordinary meeting was held on January 10, 1868. In his introductory address he plunges at once into the great deficiency of modern medicine on the therapeutical side. While recognising the value, when it can be obtained "without harm or hazard to the sick, of knowledge of the course, tendencies, and results of diseases when left to themselves," he appeals "for attempts to be made to bring the therapeutic department of medicine to a nearer level with those other parts which are strictly ministerial to this."

In the first volume we find cases of hyperpyrexial rheumatism recorded by Hermann Weber, Murchison and Sanderson, following on those which had been specially described by Ringer in 1867. This subject recurs again and again in our Transactions. At last it receives its clinical quietus, along with the full discussion of the different methods of cold-bath treatment, in the elaborate report of a special committee which was submitted to the Society in 1882.

Dr. Greenhow was for many years treasurer, and he was a tower of strength to the Society. In this first volume he reports cases of paroxysmal hæmoglobinuria, in which the essential features of the malady are set forth. These cases are investigated and verified by Dr. Pavy and Dr. Dickinson. It is interesting to note *in limine* that Greenhow's second case showed characteristic signs of Raynaud's disease. They are carefully described, though no comment is made upon them. Burdon Sanderson was the first medical secretary. He discusses, with the aid of the sphygmograph, the significance of the hard pulse in a case of Bright's disease.

The last case in the volume is a typical one. It is by Andrew Clark, and it contains his exposition of fibroid phthisis, which he claimed to be a clinical entity absolutely distinct from tubercle. That Clark's vigorous contentions were not accepted as entirely conclusive is shown in the second volume by cases carefully recorded by Douglas Powell, under the title of "Phthisis with Contracted Lung."

In therapeutics examples are given of Pavy's treatment of diabetes with opium; Broadbent initiates his suggestion on the pharmacological affinities of some of the metals, and Gee gives his report on the pharmacology of apomorphia.

Paget's presidential address, reported in the third volume, is a masterpiece. He maintains the dignity and value of case records. He compares them to the case law of a sister profession, and holds that clinical science has as good a "claim to the name and rights and self-subsistence of a science as any other department of biology." Clinical facts, he says, are as certain as anything in biology, and have remained certain for centuries, while the explanation of them has changed with every successive change in physiology. The piquant dictum that there has never been an error in practice which has not been supported by deductions from contemporary physiology is a warning that ought never to be forgotten. It reminds us of Gull's charming paradox. A doctor told him of a drug which he said was useful for the relief of a given symptom. Gull was grateful, but when the doctor proceeded to explain the rationale of the action of the drug Gull doubted the accuracy of the original observation. In this third volume Lauder Brunton's initial case of angina pectoris treated by nitrite of amyl appears, and may be fairly quoted against Gull as an instructive example of physiological suggestion. It has certainly opened up a valuable field of therapeutic resource.

In the fourth volume, for the year 1871, the most masterly case is one recorded by Hughlings Jackson on hemiplegia in a syphilitic subject, which anticipates most clearly what has subsequently become common knowledge respecting the different modes in which syphilis can affect the brain.

Gull's two presidential addresses, suggestive as they were, cannot be compared in value to his two papers on anorexia nervosa and on the cretinoid state supervening in adult life in women. If he had never written anything more than these two papers they would stamp him as one of the greatest clinicians of his time. With respect to anorexia nervosa, it may be claimed that the title given by Gull is more truly descriptive than any of those which have been subsequently employed; his clinical discrimination of this disease from tubercle, and his account of the proper lines of treatment, are both admirable.

Far be it from me to belittle the value of Weir Mitchell's subsequent papers on treatment, with the three formulas of over-feeding, massage, and isolation. But in this country I believe that compulsory and

specialised isolation has often been made a fetish, and that the elaborate and costly ritual of rest cure in nursing homes has sometimes given justifiable cause for the enemy to blaspheme against English medicine.

Some of the most important contributions to our Transactions are those on myxœdema, a disease the major part of the elucidation of which may be claimed by this Society. After the appearance of Dr. Ord's original memoir in the *Medico-Chirurgical Transactions*, case after case was demonstrated in our meetings. The mucous degeneration of the connective tissue, to which I think it is not unfair to say Dr. Ord ascribed a somewhat disproportionate importance, was for some time placed in the forefront as the essential anatomical feature. It is significant that in some of the early cases which were demonstrated to this Society no reference is made to the atrophy or alteration of the thyroid gland, although Ord had described these morbid conditions.

The report of the committee, with Ord as chairman and Hadden as secretary, appointed in 1883, was submitted in 1888. With its wealth of experimental, pathological, and clinical data, the volume constitutes the most valuable publication of the Society, and redounds to the honour of its contributors. It is only fair to recall that the all-important additions to the subject made by George Murray and Hector Mackenzie, in the therapeutic employment of thyroid extract, were given to the profession subsequently. But let it never be forgotten that the pioneer in this subject was Sir William Gull, in his simple, concise, and suggestive reports of cases of the cretinoid state supervening in adult life in women, and that Hilton Fagge's observations on sporadic cretinism in children helped to pave the way.

After myxœdema comes acromegaly, and the earliest cases of Marie's disease described in England were presented to the Clinical Society by Mr. Godlee, Dr. Hadden, and Mr. Ballance.

The early volumes contain a succession of cerebral cases by Broadbent which are models of diagnostic analysis, and the Society owes a debt of gratitude to Buzzard, who was the second secretary, and to Anstie and to Dyce Duckworth, who in the early struggling years helped with valuable clinical material when sometimes the general supply was scanty. Jenner's presidential address in 1874 is still vivid in the minds of those who heard it, for its candid statement of the deficiencies in knowledge of the etiology and personal receptivity of the acute specific diseases, and for his claim for the recognition of the experiences on these subjects of general practitioners in thinly-populated country districts.

In this connection ought to be mentioned Murchison's contribution on the period of incubation of scarlet fever and of some of the other fevers. This appeared in 1878, and gave the impetus to further enquiry. A committee which was then appointed was reconstituted ten years subsequently to further investigate the periods of incubation of the acute specific fevers. The report, edited by Dr. Dawson Williams, may be claimed as the most complete summary of reliable data on this important subject. Here also may be mentioned many valuable papers by Dr. Goodall, Dr. Francis Hawkins and others, on the complications and sequelæ of typhoid fever, and an important summary by Dr. Tooth of his personal experiences of typhoid amongst the English troops in the Boer war. Finally, in this group of subjects the report on the antitoxin treatment of diphtheria, edited by Dr. Pasteur, must never be forgotten. It represented a detailed and exhaustive enquiry on a large scale, and contributed largely to the confidence with which that form of serotherapy has become universally adopted in the English treatment of diphtheria.

Sir Andrew Clark, for so powerful a hospital teacher and so successful a general physician, left behind him far too little in medical literature adequately to perpetuate his influence in succeeding generations, and we are happy in possessing, in his presidential address of 1882, an excellent example of his somewhat rhetorical style and of his vivid practical teaching on the treatment of the common ailments of modern civilisation.

Equally characteristic is the presidential address of one who was a devoted member of this Society, and who, alas! has been recently taken from us. I mean Sir William Broadbent. In this address his generous recognition of experimental pathology and of the help of surgery to medicine, his defence of the cold-bath treatment of hyperpyrexia, and his warning against antipyretic drugs are forcibly stated, and so is the claim which he repeatedly made for the consideration of chemical affinities of the elements as suggestive of therapeutic employment. Time prevents my alluding in detail to the addresses of the other medical presidents—Sir Dyce Duckworth, Dr. Buzzard, Sir R. Douglas Powell and Dr. Frederick Taylor—every one of which embodied important practical suggestions arising out of the work of the Society.

But there are some papers of special interest which cannot be ignored because it is earnestly desired that further illustrative cases may be forthcoming in the early future. Amongst these I refer to the group of cases of localised obliterative arteritis recorded by Mr. Pearce Gould, Dr. Hadden, Mr. Morgan and Mr. Spencer. It is almost certain that other

types of recoverable arterial sclerosis and combined arteritis and phlebitis will be found if looked for, and that chronic forms of erythromelalgia will yield evidence of localised lesions more marked on the vascular than on the nerve side. The family groups of inherited splenic enlargement recorded by Dr. Claude Wilson and Dr. Batty Shaw are sure to bring to light further examples, and the same may be said of Dr. Parkes Weber's case of cyanosis with polycythæmia and splenic enlargement.

The Society has done its share towards the advancement of the study of skin diseases. Urticaria pigmentosa was gradually placed on its right basis by succeeding contributions at our meetings. The bromide and iodide eruptions, the uræmic eruptions, generalised vaccinia, Raynaud's disease, and the enema rashes, amongst others, have received their early elucidation in this Society.

Concerning the surgical work of the Society I cannot trust myself to speak in adequate terms. It has, to our shame, often loomed larger in the horizon than medicine, and has seemed in many of our volumes to show a fuller output of ameliorative result.

Let us never forget the work of our senior fellows, Heath and Holmes (who have recently been taken from us in the fulness of years), on distal ligation for aortic aneurism, and Croft on excision of the hip. The special report on spina bifida, edited by Mr. Parker and Mr. Shattock, is extremely complete with regard to the anatomical types of this malformation and its operative treatment, and the report on Charcot's joint disease, edited by Mr. Pollard, not only gave additional cases to those already demonstrated to the Society, but an elaborate summary of all that was known of the morbid anatomy and clinical characters of this affection.

With the papers dealing with surgical technique I am incompetent to deal, but I may remind you of one very notable and philosophical discourse by Lord Lister, when he was our president, concerning the subject of ligatures. The most generally attractive of the surgical cases have been those in which physicians and surgeons have jointly taken part. Our Transactions mark the successive and beneficent invasions of surgery into the diseases of the thoracic and abdominal viscera, as well as into some of those of the brain and cord. Many of these advances have not only benefited suffering humanity, but have added to our knowledge of important points in the natural history of the respective diseases, and given us information which the *post-mortem* room was inadequate to supply.

With respect to the surgery of the appendix, it is right to recall that the first case of removal of calculus from the appendix for the relief

of recurrent typhlitis was recorded in this Society by Mr. Charters Symonds, and that the operation was performed at the suggestion of Dr. Mahomed.

Mr. Henry Morris's operation of nephrolithotomy has given a great impetus to renal surgery, and the surgical treatment of intussusception, thanks to Mr. Barker and others, is now on a far sounder basis than it was before.

The operations for lesions of the biliary passages, for pancreatic cysts, hydatid disease and abscess of the liver, for perforation of the bowel in typhoid, for gastric ulcer, for neoplasms of the alimentary canal, for injuries of the spleen, are only a few amongst the triumphs of surgery which have been chronicled in our Transactions. The Clinical Society has always welcomed the contributions of surgeons of the great provincial centres. We trust we shall still secure their help, especially in what I have called the combined cases.

I would remind you, in summing up our work, of the index to the first thirty volumes, prepared by the indefatigable industry of Dr. Garrod. The second part, which deals with *subjects* and contains endless cross references, is invaluable for clinical investigation, and illustrates the urgent necessity, emphasised by all medical bibliographers, that the titles of papers ought to be made as complete and descriptive as is consistent with a reasonable amount of head space.

After this somewhat lengthy review I must ask your indulgence for a very few minutes while I mention the modifications which must arise in consequence of the absorption of the Clinical Society into the Royal Society of Medicine. Mercifully, as regards the actual material and the facility of placing it, there need be very little change. I need not labour again the essential point that we are concerned with cases, and not subjects. It is quite true that exceptionally, at times, our communications broadened out into discourses on subjects illustrated by cases. Whatever was permissible in this direction in former times, loyalty to our parent Society will not now permit of papers of this type. Such papers ought to be presented to the Medical and Surgical Sections of the Society, which correspond to the old Medico-Chirurgical Society. But surely in times past the accurate records of cases, duplicated, supplemented and corrected by repeated subsequent reports, and ultimately collated by the special committee, have been the staple of our wealth, and so they will continue to be.

The later prosperity and popularity of the Clinical Society have been enhanced by the increasing share given to the demonstration of living

8 Openshaw : *Congenital Absence of Lower Part of Tibia*

specimens. But it is extremely important that these living specimens should be as thoroughly reported and investigated as possible.

The Council proposes to continue the custom of having the living cases informally examined from 8 to 8.30 p.m. in the anteroom. But it proposes to revert to the earlier custom of subsequently having them demonstrated in the meeting. I earnestly trust that comments which have been made informally may be repeated in the meeting when the demonstration takes place, so that moot-points may be canvassed and illustrative examples may be quoted.

There is one development of the Section which I believe to be in thorough harmony with its fundamental constitution, and which I will explain. A clinical society or section ought surely to concern itself with all improvements in clinical methods. I would remind you that we have a few precedents for this. Among others I recall that Sir William Gowers demonstrated his hæmoglobinometer at one of the meetings of our Society. We propose to get some of the modern methods of clinical investigation demonstrated from time to time at our meetings.

As to the publication of our material, I believe the parent Society will prove liberal and enlightened, and that our fellows will find that their communications are in permanent print at an earlier period than in former times.

Gentlemen, I cannot conclude without thanking you for the honour you have conferred upon me. For the Clinical Section of the Royal Society of Medicine I can desire no greater boon than that it should maintain the great tradition of the Society of which it is the real representative, and for myself I can but say that to follow in the footsteps of my great predecessors—the leaders of English medicine and surgery during the last forty years—is not only an honour, but entails an infinite obligation.

A Case of Congenital Absence of the Lower Part of the Tibia.

By T. H. OPENSHAW, C.M.G.

H. H. W., a male child, aged 9 months. The child was born at full term. The labour was instrumental, and liquor amnii was absent. The mother's health during pregnancy was good, and there was no history of injury. There was no family history of malformations. In the *right leg* the tibia was fractured at its centre; the lower end of the upper fragment formed a conical projection forwards, beneath a well-

marked dimple of the skin ; the lower fragment also ended in a somewhat sharp extremity ; the internal malleolus was absent. The fibula was enlarged and curved, and there was a dimple over its upper extremity ; the external malleolus was much enlarged. The foot was in a position of extreme varus, but, with the exception of the great toe, which was atrophic, it was well developed. In the *left leg* only the upper fifth of the tibia was present. There was a deep depression over the centre of the upper part of the leg, corresponding with the edge of the fibula. The fibula was much enlarged and curved, and the external malleolus was very prominent. The foot was in a position of extreme valgus, and the great toe was absent.

Mr. Openshaw considered that amputation was not advisable in these cases, but that the foot and leg should be straightened by means of tenotomy, splints and manual osteoclasis, maintained in the straight position, and allowed to grow. The stump thus produced, if properly fitted with a suitable walking appliance, enabled the patient to walk much better in later years than would be the case were amputation at the knee-joint to be performed in very early life. The result of such treatment was illustrated by the following case.

Congenital Absence of the Fibula and Outer Half of the Foot.

By T. H. OPENSHAW, C.M.G.

W. M., a boy aged 10. Presented congenital absence of the right fibula, outer half of the foot, and two outer toes. This boy had been fitted with a leather walking appliance, accurately fitting the foot and leg and affording a firm support, to which an artificial foot was attached. With this appliance the boy was seen to walk so well that it was impossible to notice that he had any defect. He could play football and cricket, and run about all day like other boys. He had no other congenital defect.

When the boy first came under observation four years ago, the tibia was bent outwards at an angle of 120° at the lower end of the upper two-thirds, and amputation of the leg had been advised. Cuneiform resection of the tibia was performed, and the bone straightened. The wound healed up slowly, but completely, firm bony union resulting. The leg was kept straight, and allowed to grow until two years ago, when the appliance, which the boy was still wearing, was fitted.

In answer to the President, Mr. OPENSHAW stated that no other malformations were present in either of these cases.

Tuberculous Synovitis of Knee-joint in which Arthrectomy was Performed on Two Occasions, a Movable Joint Resulting.

By DOUGLAS DREW, F.R.C.S.

N. H., aged 7, came under observation in February, 1903, with chronic synovitis. Previously she had been under treatment at another hospital for some months. The joint was much distended by fluid, but there was no limitation of movement. The case was treated on a splint, and Scott's dressing at intervals was applied until September, 1904, but no permanent improvement resulted.

Operation (September 24, 1904).—The knee-joint was opened by means of Kocher's external incision. Owing to the looseness of the ligaments from the distension, it was found to be possible to completely dislocate the patella inwards, over the internal condyle without dividing the ligamentum patellæ or chiselling away the tubercle of the tibia with the ligament attached.

The synovial membrane, which was studded over with miliary tubercle, was dissected away, the inner part being rendered more accessible by dislocating the patella. It was completely removed, except for that part lying behind the crucial ligaments.

Passive movements of the joint were commenced on the twelfth day after the operation.

The case was shown before the Clinical Society early in 1905, and at that time appeared to be a complete cure. However, a few months later, fluid reappeared in the joint and in spite of treatment on a splint it showed no signs of improvement.

On May 16, 1905, the joint was re-opened through the old incision. A small quantity of fluid escaped; the cavity was lined by a smooth shining surface which was studded with minute tubercles. The synovial membrane, or what represented that structure (as the true synovial membrane had been removed at the first operation), was carefully dissected away. This was much more tedious to perform than at the first operation, as the structure was so fibrous.

It was found impossible to dislocate the patella and to get at the synovial membrane of the inner part of the joint through the external incision, and a vertical incision was made outward to the patella and this portion of the membrane was removed.

Dislocation of the Patella. ? Congenital. Operation. Cure.

By DOUGLAS DREW, F.R.C.S.

L. C., aged 13, first came under observation seven years previously with marked genu valgum.

On fixing the knee, the patella slipped outwards over the external condyle until the internal edge looked directly forwards. She had been treated for two years with splints. Macewen's osteotomy of the femur was performed, and for two years after the operation splints were worn without any effect on the patella.

The child was eventually lost sight of, and did not again return until April, 1907, when she was exhibited at the Clinical Society. At this time the condition of the patella was as heretofore, and a slight degree of genu valgum was present. There was some weakness of the limb, and the thigh muscles were small.

Various suggestions as to treatment were made, but the consensus of opinion appeared to be in favour of again rectifying the genu valgum before attempting anything else.

Largely influenced by a completely successful case which he saw operated upon by Mr. Bilton Pollard in 1890, Mr. Drew decided to proceed upon his method.

On May 14, 1907, a long external incision was made over the joint dividing the fibrous capsule, but this was not enough to liberate the patella, and the bone could not be held in position when the knee was fixed until the synovial membrane had been as freely divided as the capsule.

A similar internal, longitudinal incision was made into the joint, and the capsule was overlapped to the extent of an inch and sutured in this new position after the trochlear surface on the femur had been widened and deepened by cutting and gauging. So far the operation was much the same as that performed by Mr. Pollard, but it was found that it was not sufficient, in that, on flexing the knee, the patella still tended to ride outwards until it was situated over the external condyle. Mr. Drew therefore united the ends of the lateral incision by a curved one passing below the tubercle of the tibia. The tubercle was chiselled off with the ligamentum patellæ attached, and after denuding the internal tuberosity of the tibia of its periosteum, the tubercle of the tibia was implanted and fixed upon the denuded surface. On gently flexing the knee it was then

found that the patella moved inwards fully half an inch, instead of gliding outwards as before.

The case presents several points of interest :—

The condition is usually associated with some degree of genu valgum, and by many surgeons it is regarded as secondary and dependent upon this cause. On the other hand, it is by some looked upon as a congenital deformity, and it is held that the genu valgum is produced by the abnormal line of traction of the quadriceps when the knee is in a flexed position. Others hold that it is produced by weakness of the vastus internus, or ill-development of the external condyle of the femur. Mr. Drew considered that the congenital theory is probably correct, and that it may arise from some deficiency in the vastus internus.

If dislocation were due to genu valgum, it would be reasonable to expect that by correcting the position the tendency to dislocation, if not cured, would be lessened ; but this was not so in Mr. Drew's case or in Mr. Pollard's, in both of which Macewen's osteotomy had been performed some years previously.

That the femur is ill-developed or ill-shapen is true, but this probably results from the patella not resting in its proper position when the knee is brought from extension to flexion.

An important question must be answered before resorting to any operation. Does the infirmity damage the utility of the limb to such an extent as to call for operation ? In this case the limb was weak and ill-developed, and probably if the patient had to work as a servant, or had to kneel much, she would have found that it would have caused trouble. Except for this weakness and the accompanying genu valgum the limb was very useful, and unless it could be rendered a better member the deformity probably would be better left alone, as the operation is an extensive one and not devoid of risk.

Many different operations have been suggested and performed :—

- (1) Excision (subperiosteal) of the patella.
- (2) Over-correction of the genu valgum, so as to correct the pull of the quadriceps.
- (3) Division of capsule and deepening of the trochlear surface of the femur (Pollard).
- (4) Transplantation of the patellar ligament and tubercle of the tibia.
- (5) Transplantation of semitendinosus or other muscle—sartorius (MacLennan).

Transplantation of the semitendinosus tendon appears to me to be

liable to still further weaken the limb ; however, MacLennan, of Glasgow, reports a successful result.

Excision of the patella could do nothing but harm.

Transplantation of the ligamentum patellæ has given satisfactory results and is easy to perform. In the case under notice it would have been useless without dividing the capsule freely on the outer side of the joint.

Mr. Drew added that if another case of this nature came under his care he should proceed in the same manner, adopting Mr. Pollard's method, as he obtained a perfect result by this procedure in 1890. If it did not prove sufficient, as in the case before the meeting, then transplantation of the tubercle should be added.

Case of Multiple Rheumatic Nodules in an Adult.

By A. E. GARROD, M.D.

The patient was a young woman, aged 25, who exhibited nodules closely resembling the rheumatic nodules of children, over the metacarpo-phalangeal joints of both hands, and upon both elbows. There was a single nodule over each patella, and a larger one on the right shoulder. She had suffered from a rheumatic affection for rather more than two years, and for fifteen months had been unable to follow her occupation as a milliner. There was some general swelling of the hands, and the fingers could not be fully flexed ; there was also much general stiffness. The nodules were said to have been present for fifteen months without noticeable change. Her heart was not affected, the cardiac dulness was not enlarged, and no murmur was heard. The patient's condition had considerably improved with rest in bed, rather large doses of sodium salicylate, and the application of Bier's passive hyperæmia treatment to the upper extremities. The swelling of the hands was less marked, their movements were freer, and the nodules felt softer and appeared to have diminished in size.

Dr. Garrod expressed the belief that the patient's trouble was true rheumatism, and that the nodules, although more lasting, were of the same nature as the subcutaneous nodules of rheumatic children. He considered that, unless the name of rheumatoid arthritis were to be applied to any unusually persistent joint trouble, the present case could not be included in that category, nor did the appearance of the affected joints suggest that diagnosis. The absence of cardiac lesions, which are almost always associated with the development of the nodules in children, he was inclined to connect with the decreasing liability to such manifestations in older patients.

DISCUSSION.

Dr. SAMUEL WEST had seen several such cases in adults, and the worst of the kind he had ever observed was in a woman of about 40 years of age, who had rheumatic fever, although at the time she had these nodules she had no distinct organic heart disease. She was seen later in another attack, and then had distinct mitral trouble. There were very many nodules all over her body. The peculiarity of the present case seemed to be the long duration of the nodules.

Sir DYCE DUCKWORTH felt no hesitation in accepting Dr. Garrod's diagnosis of the case. The nodules seemed to be quite truly bred, and he recognised them as rheumatic. Such lesions had too often been considered to be ephemeral; he thought that was an inappropriate term in most of the cases. He was familiar with the condition in adults, and in some cases the nodules certainly lasted a long time. He thought that there was certainly a greater proclivity to cardiac rheumatism in childhood; whereas in adults the tendency for the heart to be implicated was much less. He had very little doubt that, under treatment, the nodules would disappear and that considerable improvement might be looked for.

Dr. BERTRAM ABRAHAMS said that he thought such nodules were not always rheumatic. Both in children and adults he had seen cases in which, in the course of five years, no signs of rheumatism appeared. He thought that these cases in adults, of which he had seen three or four examples, differed, apart from the question of duration, in their extreme symmetry; the nodules were not in little clusters on the fingers as in younger cases. He had seen instances in which the nodules were quite discrete and separate. He would like to hear from Dr. Garrod whether he had seen any cases in which there was a reasonable possibility of excluding rheumatism.

Dr. F. J. POYNTON said that, without entering into the pathology, he could not see any reason why those nodules should not last for a considerable time and become gradually more fibrous. His experience was in accordance with the more extensive experiences of Dr. West and Sir Dyce Duckworth, that one did meet with such nodules in adults lasting much longer than in children.

Dr. GARROD, in reply, said he did not bring the case forward as in any way unique. He had seen other cases of nodules in adults of very similar character. He brought forward the case as a good example of the condition, and as one in which the connection with rheumatism seemed unusually clear.

The PRESIDENT said he looked upon the case as one of typical subcutaneous rheumatic nodules, and thus agreed with the view expressed. It was the condition typically seen in children. The point made by Dr. Garrod with respect to the difference between the manifestations in children and adults was very sound. He had seen a number of cases in adults, and it was true that the association with rheumatic heart disease was not nearly so frequent in them as in children. It was also true that in children the nodules were generally much more ephemeral. He could recall cases in adults which had lasted about as long as the present one. He did not think anybody who had watched the progress of subcutaneous rheumatic nodules could have any doubt that the present ones belonged to that class.

Case of Pyo-pericardium cured by Drainage.

By F. T. STEWARD, M.S., and A. E. GARROD, M.D.

Lily S., aged 5 years 6 months, was admitted into the Hospital for Sick Children, Great Ormond Street, under Dr. Garrod, on April 8, 1907. Two days previously her tonsils had been removed, and the same evening she complained of pain in the abdomen and left chest. On admission the temperature was 103° F., pulse 120, and there was dulness and diminished air entry over the left chest below the angle of the scapula. During the next few days the temperature fell to some extent, but the signs of fluid in the left chest increased.

April 15.—The left chest was explored and pus found. She was given an anæsthetic, and the chest was opened, one and a half inches of the eighth rib being removed in the scapular line. A considerable amount of lymph and a small amount of pus were evacuated, and a drainage tube inserted. Bacteriological examination proved the infection to be pneumococcal. After this the child's condition improved for a time, and the discharge gradually diminished, but the temperature remained above normal, with daily variations between normal and about 102° F.

On May 6 the child was clearly not doing well, the temperature having risen more during the last few days, on May 4 reaching 104° F. The pulse was also increasing in rapidity, 140 to 150, and the leucocyte count increasing, being 31,000 on May 4, and 41,000 on May 6. The child also vomited twice. It was thought that an undrained loculus of pus might be the cause of the symptoms, so the wound in the chest was explored with the finger. No pus was found, but a bulging mass in the position of the pericardium was felt.

May 7.—Child worse; skiagram of chest taken.

May 9.—Cardiac dulness extends two inches to right of sternum, sounds clear but rapid, irregular; pulse 140, respiration 36. The skiagram clearly shows the shadow of a distended pericardium. Under light anæsthesia the pericardium was opened through the empyema wound, and several ounces of thick yellow pus were evacuated. After some difficulty a rubber drainage tube, with a flange one and a half inches in width, was adjusted so that the flange lay within the pericardium, the tube passing through the pleural cavity to the skin surface. After this the temperature fell gradually and reached normal on June 1. The child's condition also steadily improved, although it was very serious for several days after the pericardium was opened. The tube remained in position and drained the pericardium quite satisfactorily, so that very little pus came away after the first few days.

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May 22.—The tube was removed and replaced by a gauze drain. From this time the improvement was continuous and satisfactory, the sinus finally closing on June 14.

The child was examined on October 10. She had recovered her normal weight and appeared to be in robust health. The cardiac dullness and heart sounds were normal, and pulse 100 and regular. The wound was sound, and quite free from tenderness. The lung was found to have fully expanded, and to have separated the adhesions between the pericardium and the chest wall; resonance, and voice and breath sounds, being normal for quite two inches below the level of the scar.

The skiagram, taken by Dr. Ironside Bruce, clearly shows the increase in the area of cardiac opacity caused by the distension of the pericardium with pus.

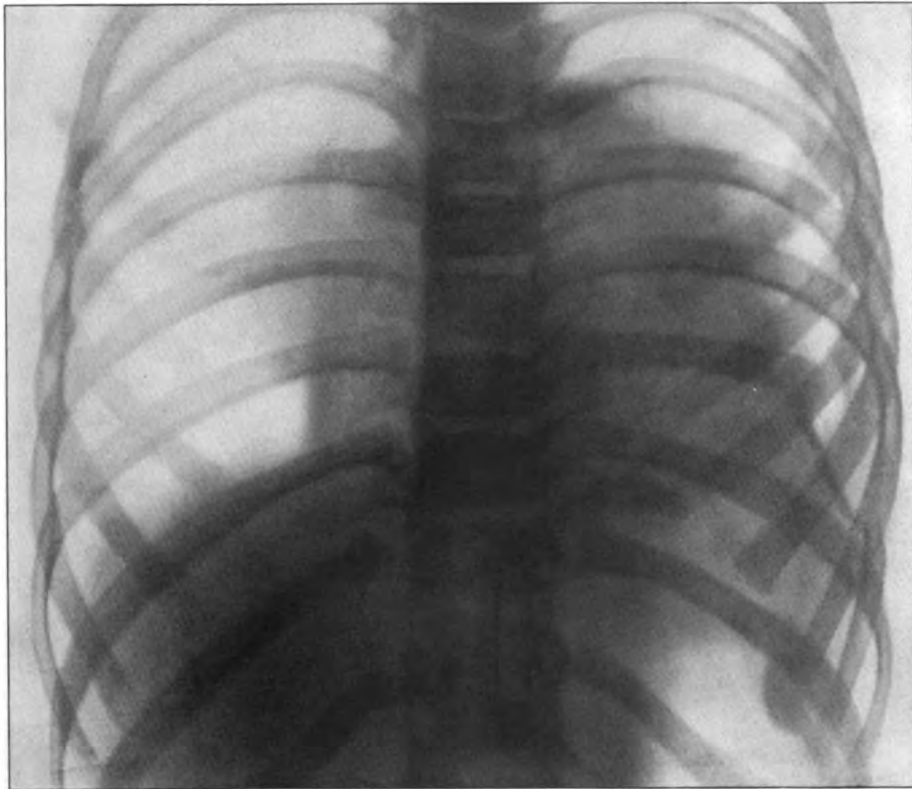
DISCUSSION.

Mr. STEWARD, answering the President, said he worked through the opening made at the earlier operation and opened the pericardium behind, because that was the most dependent part as the child was lying in bed; and, with the flanged tube, the drainage was quite satisfactory and caused little trouble.

Dr. SAMUEL WEST attributed the result rather to the fact that this was not a pyæmic case than to the position in which the pericardium was drained. He had seen several similar cases in which the pericardium had been opened from the back, and the drainage was satisfactory. The majority of the patients had died because the pericarditis was pyæmic. In his experience pneumococcal cases ran a more favourable course than streptococcal. With regard to the position of the opening, he had certainly seen one case in which the opening was made in the front and the pericardium drained perfectly, and in about a week the patient was practically well. He had seen another case in which the pericardium was opened in somewhat the same way as in the present one, but the patient died; yet, so far as the pericardium was concerned, it was emptied of pus, and was adherent three or four days after the operation. At the autopsy this was found to be a pyæmic case. He did not think there was any objection to opening the pericardium from the front, nor did he think it necessary to perform so elaborate an operation as that recommended in the books, such as removal of a portion of rib. He thought that in the majority of cases a simple incision in front sufficed. Perhaps, being a physician, he ought not to express an opinion upon surgery, but he had seen such cases and been interested in them, and the conclusions he had expressed were those to which his experience had led him.

Mr. GODLEE said he had very little to add to the discussion, because, although he had seen many cases of pyo-pericardium, the opportunity of operating upon them had been small. In one case of his, following acute infective osteo-myelitis, Mr. Raymond Johnson operated. The trouble began with an abscess in the femur, then followed pyo-pericardium, then an abscess in one elbow, and later one of the brain. The boy recovered, although the incision

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was anterior. A year later the patient died from a second cerebral abscess. Mr. Godlee also referred to a case of pyo-pericardium in which there was a communication between the pericardium and the bronchus, and the pus was expectorated. He agreed with Dr. Samuel West that an opening in the anterior part should be quite satisfactory with such a cavity as the pericardium, but he thought it well to try to avoid the pleura; if there was no indication that the pleura was adherent, there was no great difficulty in doing this.

A Case of Fusiform Aneurism of the Right Common Carotid Artery.

By JONATHAN HUTCHINSON, Jun., F.R.C.S.

E. P., a woman, aged 50. She had lived in New Zealand, from the age of 24, for nine years. She had had eight healthy children, and three miscarriages at about the fourth month. After the age of 16 she suffered from ulcerated throat for several years, and gave a history of loss of hair, and of having been subject to a bright red rash every summer. She had been abstemious in the use of alcohol. The patient gave a history of kidney trouble five years ago, and of several subsequent attacks of hæmaturia, accompanied with severe colicky pain in the left side of the back, and increased frequency of micturition. The swelling in the patient's neck was first noticed by her daughter eighteen months ago, when it was about the size of a cob-nut. During the last four months she had experienced aching pain, shooting through to the back of the neck. There was no interference with breathing, except shortness of breath on exertion, but when she swallowed the lump seemed to move up and down. On the right side of the neck was a fusiform tumour, the size of a pigeon's egg, extending from the middle line to the external border of the sternal portion of the sterno-mastoid muscle, its long axis reaching obliquely from the suprasternal notch nearly to the hyoid bone. Expansile pulsation was visible, occurring just after the ventricular systole; the second sound was audible over the tumour, but there was no thrill or murmur. The radial pulses were equal; the arteries were not thickened; and the pulse tension was good. The systolic blood-pressure in the left brachial artery equalled 200 to 205 mm. of mercury, the diastolic pressure was 130. There was cardiac hypertrophy, but no adventitious sounds were audible over the cardiac area. The pulse in both subclavian and temporal arteries was normal. The capillary circulation on both sides of the face was equal, and there was no venous engorgement. The larynx and eyes were normal. There were signs of osteo-arthritis in both knees, and a diffuse lipoma on the inner side of the left knee; the veins of the lower limbs were slightly varicose. The urine was normal.

DISCUSSION.

In reply to the President, Mr. JONATHAN HUTCHINSON, jun., said there were no signs of pressure on the nerves of the neck, unless on the recurrent laryngeal. The patient said she had noticed that her voice had become harder since the lump had appeared. It was now causing her considerable pain and inconvenience, and it had grown a good deal during the last six months. His feeling as to treatment was that, in spite of the risk of hemiplegia from tying the common carotid, it was advisable to try a distal ligature. Several such cases had been successful, and in the present patient he thought there was enough healthy artery above to admit of it.

The PRESIDENT asked Mr. Hutchinson to record the future treatment of the case, and its result.

Case of Cerebellar Atrophy.

By F. E. BATTEN, M.D.

T. W., male, aged 62, was quite well up to six years ago, when he had business worries. About that time he noticed unsteadiness in walking. Four and a half years ago he lost his balance when getting out of bed and fell. There was neither giddiness nor loss of consciousness, and he was able to pick himself up and get into bed. Since March, 1903, he has been unable to walk about. He has intermittent buzzing in the left ear, which can always be stopped by lying on his left side. He has neither headache nor vomiting. The patient had erysipelas in 1873. His three children are all well. He is an old man, very thin and wasted, but with remarkably good muscular power. Mentally he is quite clear, and is an excellent witness. The gait is markedly ataxic, but he can stand well and there is no Rombergism. The incoördination of the limbs is slight as compared to the marked ataxia which the patient presents when walking. There is slight incoördination of the hands. The pupils are unequal, the right being smaller than the left; they react well to light and to convergence. The ocular movements both to right and left are defective, and are attended by fine nystagmus to the right and slow nystagmus to the left. The optic discs are normal. The knee-jerks are active; there is no ankle-clonus, and the plantar response is flexor. All forms of sensation are perfect.

Multiple Tumours of the Skin, of Doubtful Nature.

By H. A. LEDIARD, M.D.

The patient, a schoolmaster, aged 65, first came under observation on August 13, 1907, on account of an affection which had recently commenced on the head at the junction of the hair with the forehead. At first there was a redness on the areas occupied by the tumours, which afterwards became raised and acquired a bluish tint, and when these

masses coalesced the elevations assumed a uniform deep violet colour across the head, at the hair-line.

On August 22 it was noted that the blue raised patch on the head was the size of a watch-glass, and raised like a node; and a second raised area, the size of a shilling, was seen nearer the middle line. At this time severe headache on the left side caused sleeplessness. The cervical lymphatic glands at the nape of the neck were found to be enlarged when the patient was first seen, and on August 22 those about the collar level were also felt enlarged and hard, as were also the glands behind the line of the sterno-mastoid a week later.

On September 11 there was soreness complained of, about the ribs in the left axillary line, and raising the arm was painful.

On September 18 the area on the scalp assumed a violet-blue colour. Fresh areas appeared on the temple (right), and in the neck, showing a rose-pink colour; and subsequently the shoulders and chest became more or less covered with small isolated skin growths of a dusky tint. In spite of the marked rapidity of the disease, the patient has kept to his school teaching.

At the present time there is no proof of any spread to any internal organ. The heart is strong—beating 64 per minute—the urine is normal. Pain no longer exists, and the weight of the body is kept up. Though there was no evidence of specific taint, the patient was given iodide of potassium in large doses, but without effect. Blood films showed leucocytosis, but no count has been made. Microscopic examination has not been made, and no tumour has been excised for the purpose. The characters of the disease seem to justify the diagnosis of rapidly spreading multiple sarcoma cutis.

There are no tumours on the arms, hands, or feet at the present time; the disease does not extend below the belt level. The patient thinks that some of the lumps come and go, but Dr. Lediard cannot satisfy himself that this is so, as the scalp growth has been persistently increasing, and changes almost from day to day.

According to the statement of the patient's wife, there was a redness on the head, at the hair-line in front, for four or five weeks before the patient sought advice; the redness came first, and the raising of the scalp afterwards; the redness resembled measles or scarlet fever rash. She attributed the complaint to her husband having worked in the garden without a hat for three weeks in a blazing sun.

DISCUSSION.

In answer to the President, Dr. H. A. LEDIARD said that in the first instance he treated the condition by giving iodide of potassium, starting with 10 grains,

then 20, and later 35 grains. But that produced no beneficial effect at all. Then he gave some mercury, and a little oleate of mercury was rubbed into the head, but he did not think that made any difference. He had not tried Röntgen rays, and would be very glad of any suggestions as to treatment, as well as concerning the diagnosis.

Sir DYCE DUCKWORTH said that sarcoma would not have occurred to him as a diagnosis; he did not consider that the patient was at all in a cachectic state. He suggested giving the patient very large doses of sarsaparilla.

Dr. STOWERS admitted that the case had features of unusual character, but by a process of exclusion he would arrive at very much the same view which Dr. Lediard had expressed. The only other ailments which occurred to him as like it in distribution and character were specific disease, mycosis fungoides, the latter of which was rare, and was accompanied by symptoms which were not present in this case. He admitted that the diagnosis was unproved. He thought the better plan would be to treat the case specifically at first, and to include the suggestion of Sir Dyce Duckworth, who did not seem to regard it as of the nature of syphilis. He thought the Light treatment should be tried in all similar cases of doubtful diagnosis. In the treatment of mycosis fungoides by such means during the past eighteen months he had seen results which had exceeded his expectations.

Mr. GODLEE suggested that before any of the plans of treatment mentioned were adopted a microscopical examination of a nodule should be made.

Dr. LEDIARD undertook to try to obtain one of the small tumours for microscopical examination.

Tumour in Thigh.

By CECIL ROWNTREE, F.R.C.S.

The patient is a man, aged 67, who eighteen months ago noticed a small swelling above and to inner side of right knee. It grew slowly for six months, then took on more rapid growth, and now forms a very large tumour, which extends from the gluteal fold to the popliteal space. The tumour lies beneath the hamstring muscles, which are stretched over its surface, and on extension of the leg cause the tumour to assume a lobulated appearance. It is quite soft, not attached to the femur, and very freely movable. There are no symptoms, beyond the inconvenience due to the position and weight of the swelling. The man is in good health and is able to walk ten miles a day.

DISCUSSION.

In reply to the President, Mr. ROWNTREE said he regarded it as myxoma, or myxo-sarcoma. It had been punctured, but no fluid came away.

[*Note.*—The tumour was subsequently removed. It weighed 14 lbs., and was composed mainly of fatty tissue, with somewhat dense stroma. The tumour surrounded, but did not infiltrate, the sciatic nerve. The specimen was presented to the Museum of the Royal College of Surgeons.]

Clinical Section.

November 8, 1907.

Sir THOMAS BARLOW, Bt., K.C.V.O., President of the Section, in the Chair.

Report on the Case of Aneurism shown at last Meeting (p. 17.)

MR. JONATHAN HUTCHINSON, jun., reported that he had operated upon his case of carotid aneurism a few days after the last meeting, and found that, as he had supposed, the aneurism was at the lower end of the common carotid, and did not involve the subclavian. The aneurism was fusiform, and extended into the innominate, but was not as large as he had supposed from the pulsation in the neck. It was impossible to ligature the innominate on the proximal side of the aneurism, and it was a question of the simultaneous ligature of the carotid and subclavian. As the patient was elderly, and the risk of cerebral complications from ligature of the common carotid was at least 25 per cent., he decided to close the wound. The wound had healed and the patient had left the hospital.

Trigeminal Neuralgia: Excision of the Gasserian Ganglion after unsuccessful Intracranial Neurotomy of the Second and Third Divisions of the Fifth Nerve.

By JONATHAN HUTCHINSON, jun., F.R.C.S.

A. W., a man, aged 62, began to suffer from epileptiform neuralgia of the right fifth nerve about seven years ago. The pain commenced in the lower jaw, and paroxysms lasting about thirty seconds recurred at irregular intervals during the day and night. Three years ago the inferior dental nerve was divided by trephining the lower jaw; the operation gave only partial and temporary relief. About eighteen months ago the patient was admitted into St. Bartholomew's Hospital and the Gasserian ganglion was reached through a free opening in the bone forming the floor of the temporal fossa. The second and third divisions of the fifth nerve were completely divided, but apparently no

part of the ganglion was excised. For some time the patient was completely relieved, but after about a year the attacks of pain returned, and gradually became as severe and frequent as before.

When the patient was admitted into the London Hospital sudden paroxysms of pain, lasting about thirty seconds, were easily caused by such slight stimulations as talking, eating, or a touch on certain areas of the right cheek. During a paroxysm the whole of the right side of the face became flushed and apparently fuller; the right eye became watery and the conjunctiva injected. The patient rolled about in bed, groaning with pain and pressing both hands against the right side of his face. At times the attacks recurred as frequently as every five minutes. That the divided ends of the nerves had to some extent united was shown by the fact that a considerable degree of sensation had returned in the areas of skin supplied by the second and third divisions of the fifth nerve.

On September 4, 1907, a further operation was performed. A semi-circular incision was made in the line of the scar resulting from the previous operation, and a skin flap turned downwards from the temporal region; the temporal muscle, which was much degenerated, was also turned down, and the dura mater was exposed in the opening previously made in the skull. Through this opening the dura mater was raised from the base of the skull, the middle meningeal artery being ligatured. The Gasserian ganglion was exposed with difficulty, and the ophthalmic division of the nerve being left intact, the ganglion below it was excised, together with the origin of the second and third divisions. The patient's convalescence was normal, and up to the present time there had been no return of pain. The case proved that neurotomy close to the ganglion, although it might afford temporary relief, was not an efficient cure for this form of neuralgia of the fifth nerve.

DISCUSSION.

Mr. CHARLES A. BALLANCE said that he had had the opportunity last year of seeing Dr. Abbe, to whom Mr. Hutchinson had referred, do an intracranial neurectomy. He thought Mr. Hutchinson had done an excellent operation, but that it was clear that he had removed only the lower half of the ganglion. Mr. Ballance had done that operation on two or three occasions, removing the lower half of the ganglion and the second and third divisions of the fifth nerve. The operation was a very good one, and he agreed with much that Mr. Hutchinson had said, but Mr. Hutchinson rather deprecated the operation of intracranial neurectomy of the second and third divisions of the fifth without removal of a part of the ganglion. Dr. Robert Abbe, of New York,

who was a pioneer of intracranial neurectomy without interfering with the ganglion, thought that an exceedingly good operation, and Mr. Ballance agreed with him. In three or four of Dr. Abbe's cases pain returned at the end of five years. Dr. Abbe's operation consisted in removal of a portion of the second and third divisions of the fifth, perhaps half an inch of the second division, and then filling the foramen rotundum and the foramen ovale with a solution of indiarubber made liquid by heat. It was a very important matter that in the cases in which pain had recurred it had not returned in the area supplied by the first division of the fifth. This showed that it was unnecessary in a further operation to interfere with the ganglion. The ganglion operation was an intradural one, which was obviously more risky than an extradural intracranial neurectomy, and if the whole ganglion was removed ulceration of the cornea might ensue. Therefore an intradural operation should, if possible, be avoided. In Dr. Abbe's cases in which the pain returned he opened up the flap again, and by careful dissection was able to see tiny filaments of nerve joining the proximal and distal ends of the second and third divisions, so that through or by the side of the rubber plugs the nerve filaments had partly joined together the divided ends of the second and third divisions. The filaments of nerve were divided and the openings in the base of the skull refilled with solution of indiarubber, after which there had been no second return of pain. In some of the cases five years had not yet elapsed since the operation, therefore it was not yet certain that the cure was complete, and Mr. Hutchinson's operation had only been done so short a time that one could not yet say what the final result would be. At the beginning of this year Mr. Ballance had seen a case in which, four and a half years previously, he had performed intracranial neurectomy of the second and third divisions of the fifth for epileptiform neuralgia. The pain had returned in the third division. The flap was reopened, and, following Dr. Abbe's plan, he divided what he thought to be the tiny filaments of nerve coming through the foramen rotundum and foramen ovale, which he had filled with gold leaf. The pain was immediately relieved, and he thought that even if pain did return every five years it was a safer and better operation to do a neurectomy of the tiny filaments which sometimes joined together the divided ends of the second and third divisions of the fifth nerve rather than to open the intradural space and remove the lower half of the ganglion.

Mr. HUTCHINSON, in reply, said that his criticism was directed rather to the fact that intracranial *neurotomy* was obviously unsuccessful in such a case. Mr. Ballance referred to intracranial *neurectomy*, which was a different matter. Mr. Hutchinson had done intracranial neurectomy of the second division, taking away more than half an inch from the foramen rotundum, and the case had been a complete success. In another case the neuralgia had returned in the third division. The patient was now in South Africa, but he knew that she had had some spasmodic attacks of pain in the third division. He regretted that he did not boldly attack the ganglion in her case. The pain was confined to the second division, and therefore he did an intracranial neurectomy. The present case was brought forward to show that after neurotomy nerves

reunited. Mr. Ballance's only other point was as to the value of indiarubber filling. Mr. Hutchinson had had no personal experience of this, and therefore, perhaps, ought not to have spoken slightly of it, but he did not feel attracted by the method after what Mr. Ballance had said. He did not claim that the whole of the ganglion was removed. If the ophthalmic division was left a small part of the extreme upper end of the ganglion, through which it ran, also remained. This apparently did not matter, and one could not remove the whole ganglion without going boldly through the dura mater.

A Case of Myopathy.

By BERTRAM ABRAHAMS, M.B.

T. W., an unmarried labourer, aged 43, was admitted to Westminster Hospital, July 31, 1907, complaining of pain in the back, weakness in the legs, and muscular wasting.

Family History.—Father died at 54, of dropsy, mother at 64, of pneumonia, one brother at 43 of pneumonia. Two brothers and three sisters are alive and well; the patient knows of no case of nervous disease in his family.

Personal History.—Left pleuro-pneumonia in 1883. Gonorrhœa and a bubo in 1887; no definite history of syphilis. The patient was engaged in unloading barges till about 1890; since then he has been occupied with lighter manual labour.

History of Present Affection.—About seventeen years ago patient fell down three times in one day, without apparent cause. His statement is that "his legs gave way under him, at the knees." Since then there has been gradually increasing weakness and difficulty in walking. Soon (about two years) after the onset the patient noticed flabbiness of the muscles of the front of the thighs; later on weakness of the back developed, so that he was unable to retract the head. He has been in the habit of stumbling if he put his foot upon a small obstacle, even a match. He commenced to use a stick last March, and can still walk with its aid. During recent years he has noticed weakness in the grip of both hands, and wasting of the biceps muscles of the arms. Since the onset of the illness there has been occasional pain in the lumbar region. This became rather severe in April, 1907, increasing on walking or stooping, but persisting even while at rest. During the last two years there have been occasional "rheumatic" pains in the neighbourhood of the shoulders.

Present Condition.—The patient is an intelligent, well-nourished

man, of medium height. He can stand and walk when supported by a stick, and shows no sign of ataxy. The erect posture is only maintained by the help of a marked lordosis, and the gait is straddling, with wide separation of the feet and considerable swaying of the upper part of the body. In walking the heels are not brought in contact with the ground, especially the left, on which side there is pes cavus with talipes equinus. In rising from the horizontal to the erect posture he endeavours to "climb up his thighs" like a patient with pseudo-hypertrophic muscular atrophy, but the weakness of the back muscles is so great that he is unable to rise completely without assistance.

Muscular System.—The following muscles are markedly wasted: Bicipites, pectorales majores (especially the lower part), anterior muscles of thighs (especially the quadriceps extensor), glutei maximi, supraspinati. The following muscles are somewhat wasted: Flexors of left wrist, right hypothenar group, latissimi dorsi, adductors and abductors of thighs. The calf muscles are flabby but not certainly wasted. The following muscles are hypertrophied: Deltoids, serrati magni—especially lower portion and particularly on right. Also, to a less extent, the tricipites, infraspinati, and recti abdominis. The following muscles, which are usually affected in similar cases, are here normal: Supinators longi, trapezii, face muscles.

There is no gross tremor. Fibrillary tremors have been observed from time to time in the forearm muscles, but are neither constant nor widely diffused. There is no reaction either to faradism or galvanism in the deltoids; the other muscles react fairly to both currents, and KCC. is everywhere greater than ACC.

Sensation.—The patient complains of pain in the loins and sometimes in the shoulders. During the last twelve months there has now and then been a feeling of numbness and tingling in the arms, legs, and neck.

Objective sensation is perfectly normal.

Reflexors.—The knee-, elbow- and wrist-jerks are absent. The superficial reflexes are brisk, the plantar being of the flexor type. The sphincters are normal.

There is no affection of any of the cranial nerves.

Treatment and Course.—The patient has been treated by massage and galvanism, with the internal administration of strychnine. During the three months that he has been under observation he has certainly not retrograded; he states that he feels stronger in walking, but this is not objectively evident.

Remarks.—On reviewing this case it will be seen that it does not conform exactly to any of the usually recognised varieties of myopathy. The character of the affection of the muscles of the shoulder and pelvic girdles suggests the juvenile type of muscular atrophy described by Erb. But it differs from this in the absence of atrophy in the biceps serratus, supinator longus and trapezius, the first two of which are actually hypertrophied. Moreover, the affection of the hand and forearm seen here is not characteristic of Erb's form of the disease.

The present example affords further evidence of the correctness of the view put forward independently by Charcot and by Erb, that the true myopathies are merely varieties of the same disease. The existence of indeterminate forms such as this is one of the points relied upon by Erb in his argument.

Further noteworthy facts in this case are: The age of the patient; the extreme chronicity of the disease; the absence of hereditary or collateral nervous disease; the apparent arrest of the affection during the last three months; the affection of the feet; the various subjective sensations; the loss of electrical response in the hypertrophied deltoids.

A Case of Myxœdema, with Unusual Features.

By Dr. A. M. H. GRAY (introduced by Dr. BATTY SHAW).

The patient is a woman, aged 41; she has a heavy expressionless facies, has a large amount of subcutaneous fat all over the body, especially in the supraclavicular regions, and a slightly transparent appearance of the skin. The skin is dry and rough; the hair is coarse and brittle, and falls out very easily; the nails are curved, but otherwise normal. The skin does not pit on pressure anywhere. The tongue is slightly enlarged, and on the posterior aspect of the dorsum in the middle line, about half an inch in front of the foramen cœcum, is a small papillomatous growth the size of a pea. The voice is rather husky. The patient's mental condition is quite good; she answers questions quite rationally and fairly briskly; she complains that her memory has been bad, but she is able to give a very accurate history of her case. She has never had any delusions. She states that she does not feel drowsy and sleeps well. She has been getting deaf since this illness came on.

Her temperature varies daily from 97° F. in the morning to 98° F. in the evening. Her pulse is usually about 70, but has fallen to 56 and rarely rises above 80. Her respiration varies from 18 to 24. There is a slight

degree of pulmonary emphysema, but otherwise her respiratory system is normal. Her circulatory and alimentary systems are at the present time quite normal. She has no paralysis or loss of sensation. Her superficial and deep reflexes are not diminished. The urine contains no abnormal constituents; its specific gravity varies between 1010 and 1028.

The history of the case is of considerable interest. Sixteen years ago, in July, 1891, the patient attended the out-patient department of St. Bartholomew's Hospital for a swelling in the neck, which throbbed and sometimes caused difficulty in breathing; she also had palpitation very badly, very prominent eyes, and was very nervous and tremulous; she was told that she had "goitre." She was under treatment, by medicines and electricity, for six months, and her condition got quite well; but afterwards she noticed that she was getting very stout and that her hair tended to fall out. She also complained of pain in the small of the back. Amenorrhœa occurred also at this time and lasted for seven months, and she had morning vomiting, so that she thought herself pregnant, but after the seven months menstruation commenced again and she ceased vomiting, though her stoutness did not diminish. In this connection it would be well to mention her previous menstrual history. She was regular till marriage when aged 18, and had three children before the symptoms of exophthalmic goitre appeared, but her periods since marriage had been scanty and irregular, though she had never missed more than one or two periods. Two years after the symptoms appeared she had a child, her husband dying about this time.

Nothing more of note occurs until 1902, when she noticed that the stomach and feet were becoming more swollen; and this condition gradually became so bad that in June, 1903, she was taken into Fulham Infirmary, where her abdomen was tapped and fluid drawn off. She went out much improved, but the symptoms returned and she had to seek readmission in July, 1904. She was tapped again and more fluid was drawn off, but did not cause much relief. In the notes obtained from Fulham Infirmary it is found that, when admitted in 1903, she had marked ascites and some œdema of the feet; she also had albumen in the urine and a double murmur at the heart's apex; she was tapped and 20 pints of fluid were drawn off. When admitted in 1904 she again had ascites, with œdema of the feet and albumen in the urine, but no note had been made as to the cardiac condition; nearly 20 pints of fluid were drawn off at the second tapping.

In October, 1904, she attended the out-patient department of the Women's Hospital, Soho Square, and was thought to have a ruptured

ovarian cyst. She was admitted to the wards with a view to operation, but as she had a trace of albumen in her urine, with ascites and œdema of the feet, it was thought that the ascites was probably due to Bright's disease, and she was advised to go to a general hospital and consult a physician.

On October 30, 1904, she attended the medical out-patient department of University College Hospital with the same symptoms; a provisional diagnosis of Bright's disease was made, and she was admitted to the wards in the following week. The following are extracted from notes made on admission: "November 9, 1904. Patient is a well-nourished woman, aged 38. There is a large excess of subcutaneous fat over the whole body. Skin very dry and somewhat rough. Hair dry and crinkly. Face puffy; cheeks red, otherwise complexion is sallow. Skin somewhat transparent. Pulse 88. Temperature 97·8°F. Respiration 20. The abdomen is enormously distended; several inches of subcutaneous fat on abdominal wall. Flanks bulge slightly. Nothing abnormal felt in abdomen. Slight fluid thrill. Both flanks and lower part of the abdomen are dull to percussion. Dulness in flanks shifts. No œdema of feet. Tongue large and flabby; not furred. Speech slow and deliberate. Voice very husky. Mental conditions low, but otherwise good. No sensory changes. Knee-jerks slightly increased. Urine normal." The diagnosis of myxœdema was made and the patient was given thyroid extract by the mouth, the dose being rapidly brought up to 15 grains per diem.

On November 28 considerable improvement had occurred, but fluid was still present in the abdomen. One of the obstetric physicians was called in, and he thought that a ruptured ovarian cyst was probably present and the patient was transferred to his ward. Nothing further was done, however, but the patient was watched and the thyroid treatment persisted with.

On December 31 she was sent back to the medical ward and the following note was made: "All the dryness of the skin and puffiness of the face have disappeared. Mental condition much less slow, and patient feels much better. No signs of fluid in the abdomen; girth now 43 inches as compared with 53 inches on admission." The patient was discharged shortly after this, but continued to attend the out-patient department for about a year and then ceased attending, and gave up taking thyroid extract, which had been reduced to three 5-grain tablets a week. She was readmitted on October 7, 1907, about two years after giving up treatment, and her condition was much the same as on

admission three years previously, except that there was only a small amount of fluid present in the abdomen. She has now been under treatment for a month, having 5 grains a day for the first fortnight and 10 grains since, and has shown marked improvement; the fluid in the abdomen has quite disappeared, and her weight has decreased by 9 lb. in the last fortnight, and her girth $2\frac{1}{2}$ inches.

DISCUSSION.

Dr. PARKES WEBER asked whether the urine had been microscopically examined. The character of the casts found might throw some light on the condition of the kidneys. [Dr. GRAY replied that there was no albumen, but he could not say anything about casts.] Dr. Weber, continuing, said that as there was no albumen in the urine there probably was no nephritis in this case. In some cases of myxœdema albuminuria was present, and cleared up under thyroid treatment, but he thought it probable that some interstitial nephritis remained in such cases. It was conceivable that an ascites secondary to myxœdema might similarly disappear under treatment.

Dr. A. E. GARROD referred to the case of a man who had been discharged from one of the public Services as having nephritis, who had a large quantity of albumen in his urine and œdema of his legs. He certainly had myxœdema, and under the thyroid treatment the albumen became reduced to a trace as his general condition improved.

The PRESIDENT remarked that similar cases of this paradoxical occurrence of myxœdema as a sequel to exophthalmic goitre had been described, and referred to one recorded by Dr. Pasteur in the 23rd and 31st volumes of the *Transactions of the Clinical Society*. In that case the first symptom of the developing myxœdema was bradycardia.

Dr. GRAY, replying to Dr. Parkes Weber, said that in this case no albuminuria existed when thyroid treatment was commenced, and its disappearance could not be ascribed to the treatment. Albumen was found when the patient was in the Fulham Infirmary, where the diagnosis of Bright's disease was made.

A Case of Recurrent Dislocation of the Shoulders cured by Operation.

By T. H. OPENSHAW, C.M.G., M.S.

S. C., a man, now aged 27, was first admitted into the London Hospital with sub-coracoid dislocation of both shoulders, caused by a fall whilst in an epileptic fit. He had suffered from epilepsy since 1896. The patient first dislocated his shoulder in 1897, and recurrent dislocations often incapacitated him for a week or a fortnight at a time.

On December 4, 1900, he was admitted to the London Hospital and half a drachm of tincture of iodine was injected into the right shoulder-

joint. Some arthritis followed, but, although a shoulder-cap was worn, the shoulder redislocated within a few months. Whilst he was in hospital the left shoulder was dislocated during a fit, and was reduced under anæsthesia. On December 21, 1901, 2 drachms of Morton's fluid was injected into the right shoulder-joint. The shoulder was kept at rest, and later on massage was applied. Some synovitis followed the injections, but the dislocations recurred, and by July, 1901, the right shoulder had been dislocated fifty times. In July, 1901, an anterior incision was made down to the joint, the capsule was incised, a portion of it was removed, and a part of the cartilage also removed from the glenoid cavity and head of humerus. The wound healed by first intention. For some time after the operation the patient complained of severe pain down the right arm. For the next four years the dislocation recurred, but less frequently than formerly.

In 1903 the pectoralis major was detached from the humerus, but this operation also was ineffectual.

On November 13, 1905, a further operation was performed; the subscapularis was detached from the lesser tuberosity and sutured to a portion of the deltoid, which had been previously detached. The wound healed by first intention, and a poroplastic shoulder-cap was applied.

On July 2, 1906, there having been no recurrence of the dislocation of the right shoulder for seven months, a similar operation, viz., detachment of the insertion of the subscapularis from the humerus and its attachment to the anterior border of the deltoid, was performed upon the left shoulder. The wound healed by first intention. The patient had been watched for the past sixteen months, and had had no recurrence of dislocation in either shoulder. He still had epileptic fits quite as severely as before, and had taken bromide of potassium in large doses, sometimes as much as half an ounce three times a day. It would appear, therefore, that nothing short of the final procedure above described could be relied upon as an effectual remedy for recurrent dislocation. Mr. Openshaw had performed this operation altogether three times, and in each case the cure was definite and permanent.

DISCUSSION.

Mr. JONATHAN HUTCHINSON, jun., asked whether a similar method of treatment had been previously reported. In a certain proportion of dislocations in epileptics the subscapularis was more or less torn.

Mr. OPENSHAW said that, as far as he was aware, the procedure was original.

Neuritis of Brachial Plexus, probably resulting from Arthritis of Shoulder-joint.

By W. P. HERRINGHAM, M.D.

The patient was aged 17, and for a fortnight had had fleeting pains in various joints—wrists, ankles, knees, shoulders, elbows. He was admitted into the ward with arthritis of his right wrist. He had never had rheumatism nor any affection of his heart, and there was no rheumatism in his family. He had had sore throat and fleeting pains in the joints. There was no gonorrhœa. Therefore it was regarded as a case of rheumatism, and was treated with salicylate of soda, and in two days the pain and swelling were gone. But four days later there was pain in the right shoulder again, and, thinking it was a recurrence of the rheumatism, he did not examine the patient very carefully, but again gave salicylate of soda. Two or three days later it was noticed that the deltoid was wasted. The wasting increased, and spread to other muscles about the scapula, to the biceps and brachialis, and in a less degree to the muscles of the forearm. The deltoid gave the reaction of degeneration almost from the first. In a fortnight the wasting was very marked, and he had reaction of degeneration in the deltoid, supraspinatus, infraspinatus, brachialis anticus, biceps, and weakness of reaction in the flexor and extensor muscles of the forearms, except the flexor carpi ulnaris and the muscles of the hands. Almost at the first it was noticed that pressure on the outer wall of the axilla, where the plexus of nerves lies against the humerus and the capsule of the joint, gave much pain, and a little later two fresh facts of the same kind were observed, namely, tenderness at the point of emergence of the circumflex nerve, and swelling with tenderness of the musculo-spiral. There was comparative anæsthesia over the whole limb, which was most marked down the inside of the axilla and the outside of the arm, so that it evidently was not a lesion of one root, but of every root in the plexus. The question he had raised before his colleagues at the hospital was, whether it was a peripheral lesion or one in the vertebral column. Had the patient got caries of his vertebræ? This was excluded by the skiagram, and the roots themselves were not found to be tender. It appeared, therefore, certain that it must be a neuritis, or, more strictly, a perineuritis so severe as to crush the nerve-fibres, which had chiefly affected the posterior, but in a minor degree also the other cords of the plexus. The patient had begun to improve,

but he still had tenderness of the nerves in the plexus, complete reaction of degeneration in the above-mentioned muscles of the shoulder and arm, great weakness and wasting, and a good deal of anæsthesia. He asked, What was the connection of the arthritis with the present attack in the nerves? Was the pain in his shoulder the expression of a neuritis rather than of any true relapse of the arthritis? or was it, as he thought, an inflammation which had spread from the capsule and fibrous tissue about the joint to the nerve-sheaths? He had seen instances of this in osteo-arthritis and in other forms of arthritis, but never, he thought, after acute rheumatism. He had never seen a case of perineuritis from any cause which had led to such irretrievable muscular atrophy as, he feared, was present here.

DISCUSSION.

Dr. BUZZARD suggested that possibly the arthritis in the shoulder was due to neuritis of the nerve supplying the joint.

Dr. SIDNEY PHILLIPS suggested that there was affection both of the joint and of the nerves or their sheaths. He thought that the primary affection was rheumatic. He had himself suffered severely from neuritis in the arm, and he had at the same time an effusion into the elbow-joint, with wasting of muscles and acute pain. In a number of cases he had met with intense brachial neuritis associated with effusion into the shoulder-joint. He had regarded the two phenomena as due to the same cause. He believed such brachialgiæ were not examples of peripheral neuritis, but of affections of the fibrous nerve-sheath, somewhere near the exit of the nerves between the vertebræ. He expressed the belief that many cases of brachial neuritis would be found to be associated with grating of joints.

Mr. JONATHAN HUTCHINSON, jun., referred to a case of severe spreading neuritis of the brachial plexus in a young woman, in which it was ultimately discovered that there was a fracture of the olecranon, and the neuritis appeared to have spread up from the ulnar nerve. The fracture had occurred a year before, and its presence was not suspected when she was admitted.

Dr. HERRINGHAM, in reply, said that he was familiar with the cases to which Dr. Sidney Phillips had referred, in which a neuritis was associated with a grating, apparently a dry arthritis; but the case he had just shown was of a different character. The patient had fleeting pains in many joints, a multiple arthritis, and subsequently an arthritis of one particular joint. He accepted the correction as to name; he meant a perineuritis, similar to sciatica. The affection extended to the fibrous tissues around the joint, and so to the fibrous sheath of the nerves which lay in contact therewith.

**A Case of Pigmentation with Enlarged Spleen and
Leucopenia. ? Splenic Anæmia.**

By W. P. HERRINGHAM, M.D.

The patient, a man, aged 42, till two years ago was in excellent health. He was a soldier, and then a gymnasium instructor at Aldershot. He had never been out of England, and had never had syphilis. Two years ago he noticed that he was becoming very brown, and he still had pigmentation over the body, with patches on each flank and on the finger-tips, which were of the natural colour. The penis and scrotum showed very dark and very light areas with sharp edges. During the last year, he said, he had lost a considerable amount of flesh, viz., 2 stones in weight, and for six months had been feeling very languid and weak, so that he could not do any work. He also began to vomit. He had had periodic attacks at intervals of a fortnight, each attack lasting three or four days, the vomiting recurring three or four times a day, and sometimes being accompanied with a little blood. One began to think of Addison's disease, but on examination he was found to have a very large spleen, which reached almost to the umbilicus and to the mid-line, which somewhat upset that idea. He had no ascites or jaundice, and the liver so far as could be discovered was normal. It was established that he had not been taking arsenic, which had also suggested itself as the cause of the pigmentation. At the consultation held at St. Bartholomew's some thought he might have a sarcoma which affected the spleen and suprarenal capsules, others that he might have a tuberculous spleen, with tubercular disease of the suprarenals; others suggested cancer of the stomach, and others thought he had splenic anæmia. This history so closely resembled that of a case of Addison's disease that the tuberculin test was applied, but the result was negative, and there was nothing else found amiss with him, except the enlarged spleen and a poverty of white cells in the blood. The average of several counts had been 4,500,000 red cells, and the colour index 0·93; in other words, the standard was practically normal, but he had always had leucopenia. Once the count was as low as 1,700 white cells, and there had never been more than 6,000, the latter number being just after a meal. There had been no differential change, and the red cells were normal in shape and size. He concluded that the man had a form of splenic anæmia, and referred to a case published by Stengel in which the distribution of the pigmentation closely

resembled that in the present case. An accurate gauge of the patient's muscular weakness was found in the fact that he had been unable on the horizontal bar to pull himself up once with both hands together, though when an instructor he could do so many times in succession. The patient's condition was now improving rapidly, and he could almost pull himself up on the bar with one hand. He was taking arsenic. He had previously had no drugs.

Two Cases of Congenital Heart Disease in Adults.

By R. MURRAY LESLIE, M.D.

CASE I.

C. F., a woman, aged 22, was admitted into the Royal Hospital for Diseases of the Chest on January 31, and readmitted on October 7, 1907. There was no family history of rheumatism or heart disease, and no personal history of rheumatism or chorea. She was an eight-months child and had a cyanosed appearance from birth. Clubbing of the fingers and toes had been a prominent feature from infancy. She was a delicate child and difficult to rear. At 16 years of age she worked for a period of six months in a confectioner's factory, and at 18 years of age was well enough to take a situation as housemaid, which she retained for a year and then had to give up owing to increasing breathlessness. During the last three years she had been unable to do any work, and had been carefully nursed and tended by her sister and relatives. The catamenia appeared very late (at the age of 20), and had always been irregular both in quantity and in time of occurrence. She sought admission to the hospital because of her increasing dyspnoea, which, however, became much less pronounced after a week's rest in the recumbent posture. She was intensely cyanosed, and presented the characteristic appearances of morbus cæruleus. The lips, ears, nose, tongue, and tips of the fingers were of a dark bluish-violet colour, and there was well-marked clubbing of the fingers and to a less extent of the toes and tip of the nose. The hands and feet were cold, but there was no subcutaneous dropsy, hæmoptysis, pulmonary oedema, nor enlargement of the liver. The urine was acid, with a specific gravity of 1015, and once or twice contained a trace of albumen. The average pulse-rate was 90, while the pulse itself was regular and of fair volume of tension. The cardiac apex was little if at all displaced; the right border of the heart extended somewhat to the right of the sternum. A soft-blowing systolic murmur was audible over the lower half of the left

margin of the sternum, the point of maximum intensity being the fourth left costal cartilage; the murmur was conducted inwards to the mid-sternal line, upwards to the second left interspace, outwards to the parasternal line, and downwards to the sixth left costal cartilage. The pulmonic second sound was accentuated. The blood exhibited remarkable concentration of the cellular elements, the red corpuscles numbering no fewer than 12,720,000 per centimetre, *i.e.*, two and a half times the normal number. The hæmoglobin varied from 110 to 120 per cent. The temperature tended to be subnormal.

The skiagram of the chest revealed slight enlargement of the right heart and a blunting of the cardiac apex, while the skiagram of the hands showed the absence of osseous changes at the extremities of the terminal phalanges (skiagrams exhibited). It was impossible to express an opinion as to the precise cardiac lesion present in this case. The site and distribution of the murmur suggested patency of the intra-ventricular septum, but there were probably other associated abnormalities. There was no evidence of pulmonary stenosis. The main interest of the case lay in the fact that the patient had reached adult life notwithstanding the extreme degree of cyanosis present.

CASE II.

E. W., a woman, aged 30, was admitted to the Prince of Wales's Hospital on October 18, 1900, and readmitted on September 6, 1901, and February 12, 1903, and since then has been continuously under observation until the present date. There was no family history of rheumatism or heart disease, and no personal history of rheumatism or chorea. She was a delicate child and suffered from slight attacks of bronchitis. At the age of 9 she was an in-patient at the Royal Hospital for Diseases of the Chest, under the care of the late Dr. Gilbert Smith, who diagnosed congenital pulmonary stenosis. She was at that time a poorly nourished child, her principal symptom being breathlessness on exertion. There was then no enlargement of the cardiac area, but a loud, harsh, high-pitched systolic bruit was audible over the præcordia, loudest in the third left interspace, but heard distinctly over the greater portion of the front of the chest, and also over the scapular and inter-scapular regions behind. Over the pulmonary cartilage the murmur was followed by a short, sharp, second sound. The patient continued as an out-patient at the hospital for some years, afterwards staying for varying periods at different country and seaside homes, and in the intervals being carefully looked after by her relatives. She had never

been able to engage in active work. The catamenia commenced early (at the age of 13) and had been somewhat irregular; latterly she had suffered a good deal from menorrhagia and metrorrhagia. At the age of 16 she made a good recovery from an attack of acute pneumonia. At the age of 21 she was again admitted into the Royal Hospital for Diseases of the Chest, and afterwards was transferred to the Prince of Wales's Hospital.

On admission, the patient was found to be a well-nourished woman, and complained principally of attacks of giddiness and shortness of breath. The face was congested, and there was a moderate degree of cyanosis, most noticeable in the lips. The fingers were clubbed and the nails livid. She had occasionally slight œdema of the ankles. The liver was not enlarged, but the existence of a few moist râles at the pulmonary bases indicated some pulmonary œdema. There had been no hæmoptysis. The temperature tended to be subnormal. The urine was acid, with a specific gravity of 1028, and contained a trace of albumen. The pulse-rate varied from 80 to 100, and the respiration rate from 24 to 28. The pulse was regular but of small volume, the sphygmographic tracing showing a rounding off of the tidal wave, with a rather prolonged descent. There was some visible pulsation when the patient became excited, in the second and third left interspaces, and also above the clavicles. The right border of the heart extended well to the right of the sternum. There was no thrill to be felt at the base of the heart, but there was a distinctly palpable diastolic shock in the third left interspace. On auscultation there was a loud, harsh systolic murmur heard all over the præcordia, but loudest over the pulmonary cartilage, and audible also over the posterior aspect of the chest. Examination of the blood revealed a great excess of hæmocytes, which numbered 9,630,000 per centimetre, the leucocytes numbering 9,300 per centimetre. The skiagram revealed enlargement of the right ventricle. The principal lesion in this case was undoubtedly pulmonary stenosis. There was most probably also some patency of the septa, which would afford much relief to the overcharged right heart and thus tend to prolong life. There might or might not be patency of the ductus arteriosus. The occasional visible pulsation in the upper left interspaces suggested the possibility of dilatation of the pulmonary artery.

The great interest of the case, however, lay in the fact that the patient had now entered on her fourth decade, and appeared to be in better health than ever. She could walk for a considerable distance without undue fatigue or dyspnœa. In winter-time the cyanosis became much more evident than in the summer.

DISCUSSION.

Dr. A. E. GARROD said there was a physical sign in the older patient which had not been mentioned, namely, valve shock and a very loud second sound in the pulmonary area. This he regarded as pathognomonic of pulmonary stenosis. It was not present in young children with pulmonary stenosis, but developed as life progressed. The late Dr. Peacock mentioned it in connection with a case which he described in his book on "Congenital Heart Disease," and made the suggestion, which Dr. Garrod thought was correct, that the loud second sound was aortic, and that as years went on the aorta had come to occupy a position over the patent intraventricular septum, and that the large aorta, which did the work of both arteries, was the seat of the very loud slamming second sound. He asked whether Dr. Leslie thought it possible that the other case was one of pulmonary atresia, although such a diagnosis seemed unlikely in the case of an adult patient.

Dr. PARKES WEBER said that the increase in the red corpuscles was so pronounced that the difficulty in oxygenating the blood must be very great, and he therefore suggested that frequent oxygen inhalations should be tried, in order to bring about a diminution of the red cells.

Dr. BOX said he had been interested in the use of oxygen inhalation in cases of this kind, but had been disappointed with the results. He had not had blood-counts made, but it was easy to judge from the general appearance of the patient that the oxygen was not benefiting him. He thought that the reason for the failure was obvious, because cyanosis in these cases was practically always due to one cause, viz., deficient blood supply to the lung. In some cases the pulmonary artery and aorta were transposed, each circuit being kept separate. He therefore failed to see how the inhalation of oxygen would ameliorate the condition. He had also made attempts to introduce oxygen by giving oxygen-containing compounds by the mouth, in the hope that the oxygen would reach the blood *via* the stomach. That, however, was difficult, because when oxygen was thus introduced in sufficient quantity it upset the digestion, and sickness and diarrhoea resulted. The clubbing of the fingers also was probably due to the obstruction of the blood-flow from the lungs. Recently he had seen an instructive case in which a child had difficulty in swallowing and considerable clubbing of fingers, toes, and nose. On first examination there seemed nothing to account for the clubbing of the fingers, but on examining the mediastinum *post mortem* there was found to be an ulcer of the œsophagus, and the inflammation around the base of the ulcer had extended into the mediastinal tissues, and compressed the pulmonary veins as they opened into the auricle. That was the only condition in the body to which the clubbing of the extremities could be ascribed.

Dr. MURRAY LESLIE said that he thought the age of the younger patient excluded the idea that she had pulmonary atresia, as he understood that the subjects of that condition practically never reached adult life. Oxygen had not been tried in these cases.

Pneumothorax treated by Aspiration under the X-rays.*(Abstract.)*

By JOHN FAWCETT, M.D.

The patient, a man, aged 22, was admitted into Guy's Hospital on June 5, 1907, with a pneumothorax on the right side. On admission, temperature was 102° F., pulse 128, and respiration 32 per minute. He was dyspnoëic, and the signs of a pneumothorax were confirmed by the X-ray photograph. The temperature gradually fell to normal in the course of a week. Nineteen days after the onset the condition of the chest was found to be much the same as on admission, very little absorption of air having taken place. It was therefore decided, as the patient seemed otherwise so well, to try to remove the air from the pleura.

The patient was placed on his back on the couch in the X-ray room. The screen was put over the front of the chest, and a trocar and cannula, of the usual form employed in aspirating the pleural cavity, were then inserted into the pleural sac, in front of the posterior axillary fold, in the sixth or seventh space. The lung was seen compressed towards the spine, and therefore one could determine exactly the distance that the trocar could be passed so as not to touch the lung. The trocar was then withdrawn, and the cannula connected up to a sterilised flask, containing a solution of carbolic acid (1—40). On turning the tap of the cannula so as to place the pleural cavity in communication with the flask, air was seen to bubble through the other tube in the flask at each inspiration, showing that the air in the pleural cavity was under negative pressure during inspiration. No change occurred in the compressed lung.

The tap was therefore turned off, and the tubing attached to the cannula was fixed on to a sterilised bottle from which the air had been partially exhausted. This time, on connecting the cannula with the bottle, the lung was at once seen, on the X-ray screen, to expand. As the lung expanded the cannula was gradually withdrawn until, when the lung appeared to be fully expanded, it was removed and the puncture sealed. The lung was then seen to expand and retract with the respiratory movements. A second skiagram was taken, which showed no difference in the lung on either side. The patient was carried back to bed and kept there for two days; he was discharged from the hospital twelve days later, re-examination of the thorax during that time with the X-rays showing that the lung continued to act perfectly.

Remarks.—For the first two and a half weeks of the patient's stay in hospital he exhibited little, if any, improvement as regards the absorption of air from the pleura. The improvement and relief produced by aspiration were immediate and persistent.

The patient was seen again on November 6 last, and a photograph taken, which is normal. The man looked in excellent health; he has continued his work regularly.

Provided all reasonable precautions are taken, and if suitable cases are selected, I do not see that any harm is likely to ensue from the above procedure. No doubt aspiration should not be performed too early, but if there is a reasonable prospect of the hole in the lung being firmly sealed, and if the suction employed is only slight, there is little danger of causing a fresh rupture. If the hole in the lung is not closed the lung will not expand when suction is commenced, and the aspiration can then at once be suspended. In some cases it may not be necessary to aspirate, the pressure of the air in the pleural cavity being sufficient to allow of its egress.

The case was a favourable one, but still when one remembers the long periods for which some of these patients are incapacitated, the permanent damage to the lung which at times occurs, and the, perchance, chronic invalidism to which the patients are condemned, the advantages of the method in selected cases is a very obvious one, and the risk of doing any damage very small.

DISCUSSION.

Dr. PARKES WEBER said that the same procedure had been adopted before, under the control of the X-rays. There could be no doubt that in such cases the plan was an excellent one. But if he were the patient he would not consent to it because the results in cases of so-called idiopathic pneumothorax in apparently healthy individuals were so excellent apart from any treatment. Three weeks appeared to be the outside time for recovery, and some patients got well without going to bed at all.

Dr. G. A. SUTHERLAND said that the case recalled to his mind one which he published fifteen years ago, in connection with which he was severely criticised by the late Sir William Gairdner. It was a case of pneumothorax associated with early phthisis. As the condition was very alarming, he put a trocar into the chest. There was no relief, and he therefore aspirated. He thought that he was justified in so doing, as the acute symptoms were relieved and the patient did very well. But there was much pleurisy afterwards and considerable pleural effusion, though one would not associate that with the aspiration. Sir William Gairdner adversely criticised the treatment employed, and referred to the statements of Bowditch. Dr. Sutherland found, however, that Bowditch was not

opposed to aspiration. He considered that the treatment should be adopted in cases of severe emergency. The majority of the patients with pneumothorax recovered with rest alone.

Dr. HERRINGHAM asked whether there were any signs of tubercle in the lungs, as the skiagram suggested that they were not normal.

Dr. FAWCETT, in reply, said that he had read the clinical history in brief (*vide Guy's Hospital Reports*, 1907) so as to economise time. The man was dyspnoëic and the condition of the chest showed little improvement even at the end of nineteen days. As regards the danger of the operation, he could only repeat that he believed it to be slight. A proper selection of cases was essential, and he did not recommend it for all and sundry. Even Dr. Sutherland's remarks seemed to indicate that practically any risk there was was small. His own experience of untreated cases of pneumothorax was distinctly less favourable than that of others who had spoken. The skiagrams taken by Mr. Shenton after aspiration were considered by him to show nothing abnormal in the lungs, and if Dr. Herringham had examined them with the X-ray screen he would probably have agreed with this conclusion.

Clinical Section.

December 13, 1907.

Sir THOMAS BARLOW, Bt., K.C.V.O., President of the Section, in the Chair.

Splenic Polycythæmia with Cyanosis.

By WILLIAM OSLER, M.D., F.R.S.

IN 1892 a French physician described a remarkable case in which increase in the number of red corpuscles was associated with enlargement of the spleen. Cabot afterwards recorded two cases, and Saundby and Russell, of Birmingham, another. Dr. Osler himself had had two cases under observation, and had seen two others, and in 1903 he wrote a paper on cyanosis with polycythæmia and enlarged spleen. Since the appearance of that paper there had been 40 or 50 cases recorded, and he thought that in the condition in question a new disease must be recognised. The present patient showed the three characteristic features in a very typical manner. The hands and feet were much congested, and on very cold days the fingers and toes present an appearance similar to the peripheral asphyxia in Raynaud's disease. The enlargement of the spleen in the present case was greater than in any other he had seen; the splenic tumour extended below the umbilicus, and could easily be moved to and fro. The leucocytes numbered 50,000; the specific gravity of the blood was 1075; the red corpuscles showed no special changes. There was slight poikilocytosis, and an unusually large number of nucleated red cells were present in the patient's blood. The exact nature of the disease was much discussed. There had been a few examinations—one by Dr. Parkes Weber, one by Dr. Hutchison, and three on the Continent, and all showed an enormous hyperplasia of the bone marrow, particularly that of the long bones. The pathology of the disease, as advanced by Türk, Parkes Weber, and Hutchison, was, that it was a disease analogous to leukæmia, one in which there was an over-production in the bone marrow of red blood corpuscles, a counterpart of the disease leukæmia, and he thought the anatomical conditions

met with bore out that view. The patient also showed one or two other features of great interest, which had been noted by other observers. There were vaso-motor changes, and some of the cases had a state not unlike Raynaud's disease. In some the condition was like Weir-Mitchell's erythromelalgia. There were practically no symptoms in many of the cases. The present patient scarcely felt ill at all; she had had some distension of the abdomen and a headache and a little dizziness at times, but nothing of any moment. The first case which called his attention to the condition was that of a physician whom he met frequently, who exhibited marked cyanosis in winter time. One day the physician in question came to consult Professor Osler, and he found his red corpuscles numbered more than 10,000,000 per cubic millimetre, that he had an enlarged spleen, and had for several years exhibited cyanosis. He believed this to be a definite and distinct malady, and the question presented itself to what group the cases had formerly been referred. Probably the condition was included among the conditions of "plethora" referred to by older writers. von Recklinghausen had described it very well.

DISCUSSION.

Dr. R. G. HANN asked whether the patient had suffered from any acute attacks of abdominal pain. A girl, aged 17, had recently come under his care, whose only symptom had been severe abdominal pain. Within a period of eighteen months she had had seven or eight such attacks, each lasting from two to six hours, of acute pain across the upper part of the abdomen, accompanied by abdominal retraction. The abdomen moved with respiration, there was no flatulence nor indigestion, nor other symptoms pointing to the stomach. The patient had a very large spleen, and the red blood cells numbered 7,000,000 per cubic millimetre. Otherwise she was in good health. No jaundice, cyanosis, nor enlargement of the liver were noted.

Dr. PARKES WEBER called attention to the fact that the case shown resembled the one which he had described before the Royal Medical and Chirurgical Society, in that there was an increase in the nucleated red cells circulating in the blood. On very careful and repeated examination some nucleated red corpuscles were to be found in all blood, as Dr. Boycott had shown. In most of the cases of polycythæmia with enlarged spleen there appear to have been changes in the spleen which did not seem to be necessary features of the disease, namely, infarctions. Some six post-mortems on the condition had been made, and infarctions in the spleen had been found in almost all. It might be that during attacks of perisplenitis resulting from infarction abdominal pain might be present. It seemed quite clear that the enlargement of the spleen in these cases was not due to excessive functional activity. One was at first tempted to imagine that the spleen had reverted to its fœtal functions, and was actively engaged in forming red corpuscles and other elements of the circulating

blood, but the post-mortem examinations which had been made practically negatived this supposition.

Dr. PASTEUR mentioned, with reference to the suggestion that the pain might be due to perisplenitis or to infarction, that he had a patient with a very large spleen under his care, on whom he made a post-mortem examination a week previously. She had suffered from very severe attacks of pain in the splenic region, occurring periodically; and he had fully expected that these attacks would find their explanation in one of the two conditions which had been mentioned, but neither infarction nor any trace of perisplenitis were detected.

The PRESIDENT said he had seen a case which showed the condition referred to by Professor Osler, viz., the vaso-motor changes indicated by the alteration in the colour of the hand when it was raised or lowered. The limbs of his patient were almost black when in the dependent posture, and the discoloration disappeared when they were raised. Also several of the veins became enlarged; those over the conjunctiva were enormous, and the lumen of veins in different parts of the body seemed greater than normal. In the case to which he referred the liver was somewhat enlarged, and the patient showed a very slight icteric tint, which had also been noticed in other recorded cases. The lack of real illness of the patient was very striking in view of the conditions present. Abdominal pain seemed very exceptional in the disease, and was not present in the case under his care. It was important to notice that in Dr. Hann's case there was no cyanosis, which was one of the cardinal points in typical examples. There were also other cases of cyanosis, which must have come under the notice of Fellows, in which the spleen was not enlarged, and in which, where there was no sign of congenital malformation of the heart, the diagnosis remained obscure to the end of the chapter. In a case which had come under his own observation a few years previously, he had imagined there might be some thrombosis of some of the intrathoracic veins. The patient, who had a red blood-count which was considerably in excess of the normal, had died suddenly. He (Sir Thomas Barlow) believed that, as the study of the subject advanced, it would be found that there were groups of cases in which some one or other of the symptoms was wanting, and he hoped Dr. Hann would record his case, so that the account of it might be put side by side with the present records. In the absence of cyanosis, he thought it could hardly be regarded as belonging to the group under discussion.

Traumatic Dislocation of Left Hip, replaced by Manipulation Thirteen Months after the Injury.

By T. H. OPENSHAW, C.M.G., M.S.

T. A. W., a boy, aged 15, was admitted into the London Hospital on January 21, 1907, with a history of having been run over by a motor-car on February 22, 1906.

On admission the left leg was $3\frac{3}{4}$ in. short. There was a considerable thickening of the shaft of the left femur at the seat of a united fracture, the fragments of which overlapped to the extent of $1\frac{1}{2}$ in. The head of the femur was felt projecting on the dorsum ilii. The great trochanter was rotated in, and the hip was flexed to an angle of 45° , adducted to 25° , and rotated in to 15° . There was very little movement possible at the hip-joint. The boy was wearing a 5 in. clump boot. Tenotomy of the adductors was performed, and the hip continually extended by weight. After some six or more manipulations under an anæsthetic the hip was reduced on March 14, 1907, the head of the bone being lifted over the posterior rim of the acetabulum, just as is done in Lorenz's method of reducing congenital dislocation.

Present Condition (December 13, 1907).—The hip is in joint. Bryant's triangles are equal. The movements of the left hip are restricted, there being 10° each only of flexion, adduction, and rotation. The X-rays show that a considerable erosion of the head of the bone has taken place.

Arteritis obliterans of the Lower Extremity with Intermittent Claudication ("Angina Cruris").

By F. PARKES WEBER, M.D.

THE patient, M. M., a Russian Jew, aged 42, seemed fairly well nourished, but complained of cramp-like pains in the inner part of the sole of the left foot (muscles of the instep) or in the calf of the left leg, which always attacked him after he had walked for three or four minutes and obliged him to rest a few minutes before going on. No pulsation could be felt in the left dorsalis pedis artery, nor in the posterior tibial artery behind the internal malleolus, though both these arteries could be felt beating in the right limb. The pulsation of the femoral artery was normal in both groins. When the patient was examined lying in bed scarcely any difference between the two feet could be observed, but when the legs were allowed to hang over the side of the bed the distal portion of the left foot (unlike the right foot) became red and congested-looking, especially the fourth and fifth toes. If the patient then forcibly flexed and extended the ankle-joint a few times the skin of the foot, in less than a minute, lost its congested look and became blanched and alabaster-like. If muscular exertion (by walking) were continued for three or four minutes the patient commenced to limp and had to rest on account of cramp-like pains in the muscles of the instep or the calf. If examined

at that time the foot appeared pale, but not so white as it did after only a few movements. The blanching of the foot could be to some extent lessened by making the patient inhale amyl nitrite. There was no anæsthesia, and the electrical reactions were normal and equal on the two sides. A Röntgen ray photograph of the two feet showed that the bones of the left little toe gave too little shadow.

There was no evidence of any disease elsewhere in the body. The radial arteries felt normal. The pulse was about 84, of moderate size and fair pressure. The brachial blood-pressure (estimated by the Riva-Rocci apparatus with a broad band) was 135 mm. of mercury in each arm. A blood-count gave 4,175,000 red cells and 9,000 white cells in the cubic millimetre of blood, and the hæmoglobin value was 90 per cent. of the normal (by Haldane's method). Microscopical examination of blood-films showed nothing abnormal. The urine was free from albumin and sugar. The knee-jerks and plantar reflexes on both sides were natural. The pupils were equal and reacted naturally to light. Ophthalmoscopic examination gave no evidence of disease. On the patient's admission to the German Hospital (August 8, 1907) there was ulceration on the little toe of the left foot, but the ulcer had since then slowly healed up.

The treatment in the hospital had been rest in bed (at first), the application on alternate days to the affected extremity of local hot air baths and Professor Bier's light ligature method of producing passive congestion, subcutaneous injections of fibrolysin (altogether forty-seven Merck's ampullæ had been used), medium doses of iodipin by the mouth, dermatol powder for the ulcer and wrapping up of the foot. Afterwards the patient had been given Levico water. By all this treatment it was very difficult to know whether much good had been done. The patient certainly thought he felt better, and had gained weight, and the ulcer on the toe had healed up, but the cramp-like pains (already referred to) on walking persisted.

The affection had commenced gradually about five years previously with pain in the sole of the foot on walking. Various methods of treatment had been tried, including electrical baths at the London Hospital (which certainly seemed to do good), under Dr. E. R. Morton, and treatment at a thermal water health resort. He was always more or less threatened with local gangrene, but had so far escaped with two attacks of slight ulceration on the little toe and one on the great toe. The ulceration in such cases was very indolent and slow in healing, and might be termed "ischæmic ulceration"; by "ischæmic" it was meant to imply not that the blood in the affected part was actually

deficient in quantity, but that the rate and pressure of the supply were insufficient.

It was necessary to explain that the patient suffered from two distinct kinds of pain—(1) the cramp-like muscular pains of intermittent claudication (*angina cruris*), as already mentioned, and (2) a local pain and tenderness in the affected toes which sometimes kept him awake at night, especially when there was ulceration. Sometimes there was also a third kind of pain, apparently connected with the ankle-joint.

The patient had previously enjoyed good health, with the exception of an attack of “scrofulous” abscesses (some connected with bone disease) in Russia when he was aged 4. There was no history of any venereal disease. He had always been moderate in the use of alcohol and likewise in the use of tea and coffee. He had been accustomed to smoke rather freely.

Dr. Weber said the case was a typical one of the class of obliterative arteritis which often led to gangrene of extremities and occurred in men in the prime of life, especially in poor Jews from Russia, who had been accustomed to smoke cigarettes rather freely. Within the last few years Dr. Weber had had the opportunity of seeing nine cases in male Jews of the East End of London, aged between 30 and 52, some of them employed in cigarette factories where they could obtain cigarettes without paying for them. The essential cause of the arterial disease in these cases still remained unknown. Cases in which amputation had had to be performed had been described by Dr. Michels and himself.¹ Cases had been brought before the Clinical Society or published in English medical literature by Mr. Pearce Gould, Dr. W. B. Hadden, Mr. W. G. Spencer and others. The pathology of the affection had been thoroughly studied and discussed by several writers on the Continent, including F. von Winiwarter, C. Sternberg, A. A. Wedensky, W. von Zoege-Manteuffel, Bunge, P. Wulff, and O. von Wartburg; and the relation of the vascular changes to the phenomena of Charcot’s “intermittent claudication of extremities” had been specially considered by W. Erb, of Heidelberg. Dr. Weber suspected that the cases described by Dr. Batty Shaw² under the heading “erythromelalgia” were really examples of a similar arteritis obliterans.

Gangrene might sometimes (as in the patient exhibited that evening) be delayed for years. In a man of about the same age (likewise of the

¹ *Brit. Med. Journ.*, 1903, ii., p. 566; *Trans. Path. Soc. Lond.*, 1905, lvi., p. 223.

² *Trans. Path. Soc. Lond.*, 1903, liv., p. 168.

Hebrew race), recently seen by Dr. Weber, with arteritis obliterans in the right lower extremity, the affection had remained at least two years to Dr. Weber's knowledge without getting worse. Curiously enough, some of the cases with the most decided "intermittent claudication" seemed to escape gangrene longest, as if, as Erb maintained, there were a decided nervous element in those cases in addition to the arterial obstruction. Similarly, with angina pectoris, it was often not the patients with the best-marked attacks who died first.

Intermittent claudication of extremities (intermittent limping, dysbasia intermittens of Erb, dyskinesia intermittens, dyspragia intermittens) had been described by H. Bouley (1831) in horses, by Charcot (1858) in men, and afterwards by many other writers. Great analogy between the phenomena of arterial obstruction in the leg and the phenomena of angina pectoris had been insisted on by Allan Burns (1809), Sir Benjamin Brodie (1846), Potain (1870), and notably by Huchard. Some authors (G. L. Walton and W. E. Paul) even spoke of intermittent claudication of the lower extremity as angina cruris. Angina cruris, like angina pectoris, occurred much more frequently in men than in women. The interest of the present case lay chiefly in the remarkable spastic contraction of the minute cutaneous blood-vessels of the foot which preceded the muscular cramp-like pains (angina cruris). For this reason the case might almost be described as one of angina cruris (or angina pedis) vaso-motoria. It presented a striking analogy to the form of angina pectoris described by Nothnagel (1867) as angina pectoris vaso-motoria, in which the painful phenomena of angina pectoris were preceded by contraction of cutaneous blood-vessels; but it had to be remembered that Nothnagel, in his cases, thought that the whole symptom-complex was of vaso-motor origin and that there was no organic disease present.

Dr. Weber thought that the congested condition of the foot in the case he exhibited and in similar cases (best marked, of course, with the limb in the dependent position) was of conservative nature, and that it might be explained as an automatic attempt to compensate (for the arterial obstruction) by dilatation of capillaries and venules; that is to say, as an automatic attempt to favour collateral circulation as far as possible, and to make up for deficiency of the arterial supply by increase of the total quantity of blood in the affected part.

Methæmoglobinæmia of Twelve Years Standing.

By W. ESSEX WYNTER, M.D.

F., AGED 45 (under observation since March, 1902). Has been in the same state of cyanotic anæmia for twelve years, and was originally considered to be suffering from Addison's disease. There is a general yellowish pallor, with lilac-coloured mucous membranes, associated with feebleness, constipation, anorexia, and occasional vomiting. Temperature 100° F. Pulse 74-96. A pulmonary systolic bruit existed while the patient was in hospital. Urine normal. Blood chocolate-coloured, making comparison difficult in the hæmoglobinometer; the colour is not altered by exposure to CO; red cells, 3,010,000; white cells, 7,000; hæmoglobin, 50 per cent.; index, 0·74; lymphocytes, 22·6; transitional, 2·8; hyaline, 1·6; polymorphonuclear, 71; eosinophile, 0·2; mast-cells, 1·8; bacillus coli not found in blood. The spectroscope showed the band in red of methæmoglobin, which disappeared on the addition of ammonium sulphide.

DISCUSSION.

Dr. POYNTON said the patient was in St. Mary's Hospital when he was house physician there, twelve or thirteen years ago, and she was then in that curious condition. At that time he thought it was aniline poisoning. She had the present great difficulty in going upstairs, with breathlessness, and a dusky condition of the skin which was puzzling.

The PRESIDENT reminded Fellows that it had been the custom of the Clinical Society to refer an obscure case to a Committee, on which the exhibitor served, for investigation. The case under discussion would bear investigation from many sides: for instance, as regarded the occupation of the patient. She was engaged in making artificial flowers, and there might be something in the materials used which was an influence in the condition.

It was agreed to refer the case to a Committee, consisting of Dr. Drysdale, Dr. Poynton, Dr. Garrod, and Dr. Essex Wynter, that Committee to report to the Section.

Amytonia Congenita.

By W. ESSEX WYNTER, M.D.

F., AGED fifteen months. Admitted to Middlesex Hospital September 21, 1907, on account of general weakness and backwardness. The parents and brother and sister are quite healthy. The child had been attending for two months at the Hospital for Sick Children, and was

stated to be getting weaker and thinner. The striking feature in the condition is the flabbiness of muscles and freedom of movement in articulations, allowing of flexion and extension beyond normal limits, so that the toes can be made to touch the front of the leg and the fingers the back of the forearm, while the legs can be flexed up to the chin. The child can sit up and walk, and is cheerful and intelligent. The face is not affected. The muscles of the limbs, though flabby, show fair bulk, and respond to voluntary impulses. They do not contract to strong faradism, and moderate currents induce no pain. A full account of the case will be published in *Brain*.

DISCUSSION.

The PRESIDENT said he hoped Dr. Wynter would keep his eye upon the case with a view to seeing what the ultimate result was. He had himself seen two such cases of it in years gone by, but he was not aware of the ultimate issue.

Dr. MORLEY FLETCHER asked why the case should not be regarded as one of severe rickets, in which the stress fell not upon the bones but upon the muscles. Cases of rickets sometimes resembled the present case closely, and he thought that the patient shown was suffering from rickets. He had seen a considerable number of cases with amyotonia and great flaccidity of the muscles, which improved very much under the treatment appropriate for rickets.

Dr. ERNEST JONES asked why the name amyotonia was preferred, as Oppenheim, who first described the condition, assigned to it the name of myotonia congenita, and it was so called in the writings on the subject.

Dr. WYNTER, in reply, said there was but little in the literature, as he believed cases of the kind had only been described during the last year or two. The flaccidity of the muscles had existed from birth. There were two other children in the family, quite healthy. The absence of electrical reaction in the present case was a feature which would scarcely exist in simple rickets, and changes in the bones were not very marked.

Cure of Ascites by Permanent Drainage through the Femoral Ring.

By W. ESSEX WYNTER, M.D.

M., AGED 50. Admitted to Middlesex Hospital July 11, 1907. For a week there had been swelling of abdomen and legs, with slight jaundice. He had been rather a free beer drinker. There was no evidence of cardiac disease, but the daily output of urine was only 15 oz., and it contained

a trace of albumin; specific gravity 1010. Purgative diuretics and Canadian hemp were tried without effect. The ascites increased, and on August 26 tension was relieved by removing 300 oz. of fluid. This was only of temporary benefit, and on September 23 Mr. Sampson Handley made a small incision below the umbilicus and several pints of fluid escaped. An incision as for femoral hernia was then made, and with the aid of one finger in the abdominal cavity the process of peritoneum was drawn down, split, and the edges stitched right and left to maintain the opening. The wounds were then closed. Owing to some leakage at the femoral wound, paracentesis was performed a week after operation. Some oozing from a stitch puncture in the thigh continued for about three weeks, showing that the communication with the peritoneal cavity remained open, but the ascites did not recur, and by November 20 there was no perceptible fluid in the abdominal cavity. The patient has been walking about the ward for a fortnight, and neither femoral hernia nor œdema of the leg has developed; indeed, the girth of the right thigh is an inch less than on the opposite side. In this case the femoral operation was performed deliberately for the cure of ascites, with the object of draining the abdominal cavity into the tissues outside the abdomen, so saving repeated paracenteses and the removal of quantities of albuminous fluid, and to enable the patient to get about.

Mr. SAMPSON HANDLEY said that, although he was associated with Dr. Wynter in the case, the idea was entirely due to Dr. Wynter, and that he had simply carried out the operative work. He made a flap incision over the femoral ring, as for femoral hernia, so that the line of the incision should not correspond anywhere with the opening in the ring. The convexity of the flap was directed outwards. The main difficulty was that the peritoneum did not bulge through the femoral ring, notwithstanding the pressure of the ascitic fluid; and that, owing to the prominence of the abdomen, it was difficult to find the femoral canal without risk to the femoral vein. It was therefore necessary to make a small median abdominal incision, large enough to admit one finger, by which he felt the crural ring, and made the peritoneum of the crural canal protrude into the femoral incision. In future cases he proposed to tap the abdomen with a curved trocar just above the pubes, and, through the cannula, having allowed a certain amount of fluid to escape, to introduce a long curved seeker fitting the cannula, by means of which one would find the ring from inside, and make the peritoneum of the femoral canal protrude. The peritoneum was seized by two pairs of forceps and snipped between by scissors. Two sutures were next introduced, one on each side, taking up the peritoneum of the femoral canal and also passing through Poupart's ligament. When these sutures were tied, the patency of the artificial opening was secured, its edges gaping widely. The operation was completed by suturing the skin.

A Case of Acute Anterior Poliomyelitis with Permanent Paralysis of the Diaphragm and Abdominal Muscles.

By W. PASTEUR, M.D.

J. B., a healthy schoolboy, aged 13½, complained on November 12, 1906, of shooting pains in both thighs and severe pain across the abdomen at the level of the anterior superior iliac spines. There was fever with delirium during the night and part of the next day, with continuance of abdominal pain. In the night of November 13 there were sharp pains in both legs, increased by movement, and on the following morning the boy could not leave his bed on account of loss of power in the legs. By November 16 he was quite helpless, and his mother noticed that he could not cough. He was unable to move himself in bed, but the arms were not entirely paralysed.

On admission, November 19 (eighth day of illness), he was found to be completely helpless, but free from pain. The voice was clear, but very weak, and there was an almost constant, toneless, non-explosive cough. The expression was natural, the face high-coloured and rather dusky. The boy was obviously gravely ill. Respirations were 40 per minute, but not distressed as long as the boy did not talk or exert himself; pulse 100, of good quality; heart normal. Sensation was everywhere normal. There was total flaccid paralysis of both lower limbs and buttocks, except faint flickering voluntary movements of the right peronei. The paralysed muscles did not contract to faradic or galvanic currents. The plantar and cremasteric reflexes and the knee-jerks were absent; the sphincters were unaffected, except that a few unconscious evacuations occurred during sleep in the first ten days. There was no movement of the abdominal muscles during respiration, which was entirely thoracic, nor was any visible contraction elicited when the boy attempted to cough or to raise his head from the pillow. The diaphragm was paralysed. The abdominal and epigastric reflexes were absent. The patient was quite unable to turn to either side, but could arch his back very slightly. The movements of the thorax were equal on the two sides, but deficient. There was paresis of all the muscles of both upper limbs, especially the right. The extensors only contracted to strong faradic currents; the flexors reacted normally. There was no paralysis of the face, tongue, palate or pharynx. The ocular muscles were normal; the pupils were equal and dilated. Air entered the front of the lungs fairly; in the axillary regions the breath-

sounds were weaker. The backs were not examined on account of the critical state of the patient.

Progress.—Except for the integrity of the soft palate and pharynx, the case, on admission, very closely resembled a widespread diphtheritic polyneuritis. The condition of the patient was most serious, the least attempt at disturbance or exertion causing a grave embarrassment of respiration. This critical phase continued for ten days after admission. The paralysis of the diaphragm had led to lobar collapse of the left lung, with secondary pneumonia. Cyanosis deepened, and breathlessness became so urgent that for several nights the boy could get no sleep. He was literally kept alive during this period by artificial respiration every two or three hours, very frequent inhalation of oxygen, and hypodermic injections of strychnine. There was moderate fever (100° F. or 103° F.), with a termination by crisis on November 30. After this the boy began to gain strength slowly, and the constant hacking cough soon ceased.

On December 5 it was possible to make a complete examination of the chest. The following note was made: "There is marked flattening of the subclavicular region on both sides. The area of visible impulse of the heart is increased. There is general shrinking and very little movement of the left chest. The intercostal spaces are depressed and do not fill up during respiration. The percussion note is dull all over the lower lobe and deficient over the remainder of the lung. The breath-sounds are high pitched and tubular all over the base, with scanty crepitations. The stomach note rises as high as the sixth rib in the mid-axillary line. Physical signs more normal over right lung, except at extreme base, where air entry is poor and the percussion note somewhat deficient. There are no signs of diaphragmatic action."

Recovery of muscular power began early in December. It was mainly limited to the arms, neck and shoulders. By the end of the month the boy could make full use of his upper limbs, was able to turn himself over in bed, and could lift himself into the sitting posture. There was no power to move the pelvis and lower limbs.

Recovery of respiratory power was slower. At the end of January the left chest was still smaller than the right, the lung being only partially expanded, with weak breath-sounds and impaired percussion note. The diaphragm was still inert.

He returned from the convalescent home on March 21 in excellent health, but without any appreciable improvement in the paralysis, which had remained *in statu quo* as regards the pelvis and legs. There was, however, a marked recovery in the thoracic muscles. The subclavicular

flattening had quite disappeared on the right, and was decidedly less obvious on the left. Air entered well on both sides. Electrically there was no response to faradism in the glutei and the muscles of the abdomen, thighs and legs on both sides. Elsewhere the reactions were those of health. This condition has persisted up to the present date, one year after the onset.

Case showing unusual situation of Gouty Deposit in the Olecranon Bursa.

By J. GRAHAM FORBES, M.D.

J. W., a labourer, aged 32, has suffered from gouty deposits in the ears, elbows and fingers for the last four to five years, *i.e.*, since the age of 28. Tophi first appeared in the ears four and a half years ago, then the olecranon bursæ became enlarged, while the fingers and wrists have only been affected for the last two years. The patient, who has been a fairly heavy beer drinker for fourteen years, has never had an acute attack of gout, beyond being laid up for a week two years ago with what he describes as "rheumatism"; and there is no history of gravel. His father's brother is the only relative whom he knows to have suffered from gout.

The interesting feature of the case is the condition of the bursa over the left olecranon. It forms a swelling about the size of a small Tangerine orange, and contains a mass of chalk-like concretion visible through the thin layer of overlying skin. At one part is a soft fluctuating area covered by red shining skin, suggesting the presence of pus; this has subsequently burst, exuding a thick milky fluid, which under the microscope is seen to be composed entirely of fine acicular crystals of sodium biurate. In stained film preparations a scanty number of leucocytes and amorphous masses are visible, but no organisms can be recognised.

The right olecranon bursa is also thickened and enlarged, but to a less degree than the left. Here, too, there is evidence of uratic deposit.

There is no history of definite injury to the elbows, but his employment as labourer and the uratic deposit elsewhere visible would explain the occurrence of a bursitis, in which gout and a repetition of slight unnoticed bruising have taken part. The elbow-joints themselves are unaffected and freely movable.

The rarity of this situation and size of uratic deposit occurring in a man under the age of 30 is worth emphasising. In addition the patient shows the distribution of gout in the more common parts of the body.

Both ears contain several tophi, notably the right. There is a definite thickening about the left shoulder-joint and wrist, so that the hand cannot be raised to the head, and movements at the wrist are much restricted. Subcutaneous deposits also occur in the thumb, index and little fingers of the left hand, and over the dorsum of the right, the thumb, second, third, and fourth fingers of which are more or less crippled by the thickening and deposit about the phalangeal joints, and now present an acute recrudescence of the gout.

In the left leg the synovial membranes of the knee- and ankle-joints are thickened, but there is no evidence of uratic deposit about the great toe-joints. Examination of the chest reveals no abnormal physical signs or evidence of cardiac hypertrophy. The pulse tension is not raised and the arteries are not obviously thickened. In the abdomen the edge of the liver can just be felt, but the normal upper limit of hepatic dulness is unaltered.

Urine.—On November 23, pale in colour, specific gravity 1010; albumin, definite trace. On December 7 and 14 it was highly coloured and contained a heavy deposit of albumin.

It is noticeable that the elbow- and finger-joints show no evidence of articular erosion, or changes associated with rheumatoid arthritis.

Excision of the tophous mass on the left olecranon is to be performed.

DISCUSSION.

Professor OSLER remarked that such very large tophaceous masses might occur in gout without any other obvious signs, as also might large, flat, plaque-like masses along the triceps tendon, apart from any tophi or other signs suggestive of gout, until they were removed surgically. He had met with several cases in which the diagnosis of gout was not made until the removal of the tumour. In one case there was a very large flat plaque as large as one's hand in the lower part of the back, and when the tumour was removed and sections of it were cut, it was found to be a gouty tumour. He thought surgery was the proper treatment for such cases, and that early removal was advisable. He believed that a certain number of fibrous swellings about the patella were gouty, though they were not thought to be so in the absence of tophi.

Dr. POYNTON agreed that in such cases there might be no sign of gout until the tumour was removed, when in the centre of the nodule a tophaceous deposit might be found. Under very high power tiny specks of urate were just visible in sections. The earliest change was necrotic in nature. It would be interesting if Dr. Forbes could get a bacterial cultivation from one of the tumours, as it was from such cases that one might hope to obtain evidence of a bacterial factor in gout.

Dr. PARKES WEBER said that at the first meeting of this Session Dr. Garrod had shown an adult woman with fibrous-looking nodules on the elbows, and the opinion of the Society was that the case was not one of gout, but of rheumatism. He himself had shown, last year, at the Medical Society of London, a man with apparently similar nodules about the elbows. He believed that such fibrous nodules in adults might or might not contain uratic deposit, and he believed that the development of fibrous tissue in the nodules in question was of the nature of a "conservative" vital reaction. There might or might not be a primary necrotic centre, as Dr. Poynton suggested.

Dr. A. E. GARROD regarded the bursa over the olecranon as one of the seats of election for gouty tophi, but it was unusual to see them in a patient of the age of the present one. It was an admirable course to treat them surgically, so long as one was sure that one was dealing with a bursa, but surgical interference with tophaceous deposits in other situations was likely to be harmful, as the deposits often extended far into the deeper structures of the parts.

A Case of Bulbar Paralysis.

By H. BATTY SHAW, M.D.

THIS case, shown through the courtesy of Sir Thomas Barlow, President of the Section, is exhibited because of the association of invagrescent bulbar paralysis with a malignant bronchocele.

M. A., a widow, aged 47, has suffered for the previous twenty years with a large bronchocele and slight attacks of periodic huskiness of the voice. In February, 1903, there was also cough, which was observed to be distinctly "brassy" in character, unaccompanied by any paralysis of the vocal cords, and probably due to pressure on the trachea. In addition there was subsequently observed on occasions tachycardia, and tremor of the hands was always more or less present; there were no other signs of exophthalmic goitre. A systolic sound was constantly observed at the apex-beat of the heart.

In June, 1907, the patient was admitted under the care of Mr. F. B. Jessett, at the Cancer Hospital, for the symptom of pressure on the trachea, which was intensified in recumbency. More than half the bronchocele was removed on June 25, the operation being accompanied by considerable hæmorrhage. On July 8, the voice was almost completely lost, stridor developed, and weakness of the left lower facial muscle was observed; pain and stiffness of the back of the neck was observed on July 15. On August 21, there was well-marked atrophy of the right half of the tongue, and on the 28th of the same month there was diplopia.

On admission to University College Hospital on November 5, she was found to have lost over a stone in weight compared with the weight in 1903; the pulse-rate was 146 and the temperature 99° F. The following signs were also demonstrable: There was paresis of the sixth nerve on the right side, paresis of the right half of the palate (spinal accessory), paralysis and atrophy of the right half of the tongue (hypoglossal nerve), paresis and atrophy of the right sterno-mastoid muscle (spinal accessory) and of the right trapezius (spinal accessory, first, third and fourth cervical nerves). The patient was found to be aphonic, and only able to swallow solids with difficulty. In addition to the above nervous lesions on the right side, there was weakness of the left lower facial muscles and complete paralysis of the left vocal cord. A recent symptom was vomiting.

At the operation, details of which were kindly supplied by Mr. Jessett, the trachea was markedly deflected to the right, the thyroid cartilage being felt below the right angle of the lower jaw; a spur-like prolongation upwards of the thyroid gland was removed, as well as the greater part of the left part of the gland; the normal thyroid tissue was found microscopically to be replaced by the development of a carcinomatous growth.

The diagnosis lies between a primary degeneration of the centres of the various nerves involved, possibly due to thrombosis, and a secondary deposit in and about the medulla; the latter hypothesis is supported by the presence of severe pain and stiffness of the muscles of the back of the neck.

There is no reason to think the patient suffered from syphilis; a son recently died, aged 22, of diabetes mellitus. The patient suffered from pleurisy of the left side of the chest seventeen years ago.

Hepato-splenomegaly with Ascites.

By H. BATTY SHAW, M.D.

F., AGED 3½, was noticed to be short of breath in June of this year. She is now easily tired and unable to walk far owing to shortness of breath. The abdomen was observed to be swollen on November 22 of this year, and this has increased steadily. She is the eldest of three children. Both mother and father have had rheumatic fever, and the mother has had one miscarriage since the birth of the youngest child. This child was breast-fed till eight months old, and then was fed on boiled milk till solid food was given.

There are no signs of tuberculosis or syphilis. The liver is enlarged and the spleen could be felt easily until recently, when the ascites has increased. There is no albumin in the urine, nor are there signs of cardiac disease. The blood-count is normal for a child of this age except that the percentage of hæmoglobin is only 64. Jaundice has not been observed.

A Case of Ochronosis.

By EDGAR REID (Swansea).

(Introduced by Professor OSLER.)

THE patient, a woman, aged 68, had a large ulcer upon each leg, which had been dressed with carbolic oil (1 in 20) for a period of thirty years. Six years ago pigmentation of the ears and whites of the eyes was observed, and two years ago the urine was first noticed to be dark in colour. In June, 1907, when she was admitted to the Swansea Hospital, the concavity of each ear showed a deep blue-black staining, whereas the peripheral part of the auricle was free from pigmentation. There were also patches of pigment in the exposed portions of the sclerotics of both eyes. The extensor tendons of the fingers were bluish black in tint over the knuckles, and the knuckles themselves showed a slight staining. The skin of the face and exposed parts had a dusky hue, as compared with that of covered parts. Since June the patient had been kept in bed, and the ulcers had steadily diminished in area. Although carbolic dressings had been continued the staining has perceptibly diminished.¹

Dr. Reid called attention to the fact that in three other cases of ochronosis recently reported there was a similar history of prolonged application of carbolic acid, and he agreed with Pick in attributing the condition where this was the case to the slow absorption of carbolic acid. He suggested that "phenolism" would be a more appropriate name for this group of cases of ochronosis.

DISCUSSION.

Professor OSLER said that, in the three cases of ochronosis which he had seen, the condition was associated with alkaptonuria, but it appeared certain that, in a certain number of the cases, ochronosis was associated with carboloria, as in the present instance. Two alkaptonuric brothers whom he had had under observation both presented exactly the same condition as was seen in the present patient, namely, pigmentation of the sclerotics and of the hollows

¹ A full report of the case, with a coloured plate, has appeared in the *Quarterly Journal of Medicine*, 1908, vol. i., No. 2, p. 199.

of the ears and staining of the cartilages of the knuckles of a steel grey colour. They suffered no inconvenience, save that one of the brothers had been much troubled of late by a butterfly-shaped pigmentation, which began over the bridge of his nose and spread on to his cheeks. The staining was not confined to the cartilages, but affected the fibrous tissues also. Ochronosis was rather a clinical curiosity than a phenomenon of any special morbid interest. It could be very readily diagnosed by the pigmentation on the sclerotics and of the hollows of the ears.

Dr. A. E. GARROD said that this was the first case of ochronosis he had seen, but a study of the literature of the subject left no doubt that, among the 14 cases on record, there were examples, not only of the two conditions which had been mentioned, viz., alkaptonuria and carbohc acid absorption, but of other conditions also. There were two cases on record in which dark urine was passed for many years, but in which observers who could speak with authority had excluded the presence of either alkaptonuria or carboluria. A patient whose case was recently described by Clemens was proved to have ochronosis at a post-mortem examination, and was almost certainly the subject of alkaptonuria. In a specimen of the urine of Dr. Reid's patient which he had recently had the opportunity of examining, the aromatic sulphates constituted no less than 85 per cent. of the total sulphates, which showed that the patient had some degree of carboluria, and the urine showed a very slight smoky tint. Dr. Garrod added that it was interesting to note that in carboluria and alkaptonuria the darkening of the urine which occurred on exposure was due to the presence of hydroquinone in the one case, and of a hydroquinone derivative, homogentisic acid, in the other.

Dr. HALE WHITE pointed out that Dr. Reid's patient had xanthelasma palpebrarum. This condition was also observed in Dr. Pope's case of ochronosis, and although it was not mentioned in connection with any of the other recorded cases, referred to by Dr. Pope in his paper in the *Lancet*, it seemed probable that the association was not merely a coincidence.

Dr. PARKES WEBER asked what were the first signs observed in cases of ochronosis, and where the pigmentation was first noticed. There were some remarkable cases of slaty blue pigmentation, of which he had seen an early example a short time ago, which were apt to be regarded as examples of some form of cyanosis. The case which he had seen showed how easily such a condition might be misinterpreted even by careful observers. A diagnosis of a form of Raynaud's disease was made, although the blue pigmentation was most marked upon the face. If the skin were rendered anæmic by pressing a glass slide upon it, the peculiar dusky bluish tint persisted. This sufficed to exclude cyanosis, and showed that the skin was actually pigmented as in hæmochromatosis.

Dr. REID, in reply, said the condition first appeared in the ears and in the conjunctivæ simultaneously, and was noticed by the patient before there was any noticeable alteration of the tint of the skin. The change was most marked in the exposed parts.

Clinical Section.

January 10, 1908.

SIR THOMAS BARLOW, Bt., K.C.V.O., President of the Section, in the Chair.

Polycythæmia with Enlarged Spleen without Cyanosis, in a girl, aged 18.

By R. G. HANN.

PATIENT, an intelligent girl, aged 18, with the appearance and manners of 15 or 16, living in comfortable circumstances, has been under observation since December 3, 1907. She was perfectly well till she was aged 13, never robust since, though her general health has been better during the past twelve months than during the preceding four years; apart from attacks of abdominal pain, she is without symptoms. She is growing in height and her weight is increasing. When aged 15 had two menstrual periods; none since. Her long chest and abdomen are infantile in character, showing no signs of broadening; external genitals infantile, no growth of pubic hair, no mammary development; she is very thin, and her muscular development is poor. She has never been cyanosed or jaundiced. Spleen considerably enlarged, reaching three fingers' breadth below the costal margin; surface smooth, never tender or painful. Liver and other abdominal and thoracic organs apparently normal. Blood examined on December 6, 1907, by Dr. G. Watson: Red cells, 6,800,000; white cells, 7,980; no abnormal forms; differential count of white cells normal. Blood further examined by Dr. O. C. Gruner on December 30, 1907: Red cells, 6,200,000, slight differences in size, otherwise normal; white cells, 11,580;

7,480 polynuclears per cubic millimetre, or 64 per cent.

3,270 lymphocytes	„	„	28	„
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715 large mononuclears	„	„	6·2	„
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23 mast-cells	„	„	0·2	„
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92 eosinophiles	„	„	0·8	„
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hæmoglobin, 115 per cent. (Gaertner's apparatus); colour index, 0.915; specific gravity, 1038 (Hammerschlag's method); viscosity (water being 1), 5.3 at 13° C. The osmotic pressure was measured in terms of Na Cl by determining in what strength of Na Cl hæmolysis would not occur. In this way a 0.88 per cent. solution Na Cl was found to be isotonic with the non-defibrinated blood. The hæmolysis was determined by centrifugalising the mixed blood and salt solution in Hamburger's special pipette.

Severe attacks of abdominal pain have been the only symptoms complained of. They first appeared in 1906, in which year she had eight distinct attacks; after a clear interval of eleven months she had one on December 3, 1907, and another on December 27. The pain is extremely severe, extends across the upper abdomen, and is not referred especially to the splenic region. The paroxysms last from a quarter of an hour to six hours, begin and end suddenly, come on at any time of the day or night, and are independent of the ingestion of food. During the pain the abdomen is retracted; it moves on respiration; no superficial or deep tenderness; no flatulence, vomiting, or diarrhœa; pulse about 120. The temperature is never raised, and after the attack on December 3 it remained subnormal during the succeeding fourteen days on which it was regularly observed. It seems improbable that perisplenitis or infarcts would account for these crises. No evidence of pancreatic disease. Patellar reflex and pupil reaction normal. The lymphatic glands in the neck and axillæ can be felt, but cannot be said to be definitely enlarged. There are no signs of tuberculous disease elsewhere.

It is likely that the condition has been present for the last few years, and whatever it may be due to, the case is undoubtedly tending towards improvement.

DISCUSSION.

The PRESIDENT (Sir T. Barlow) expressed the indebtedness of the Section to Mr. Hann for bringing the patient all the way from Leeds. It was most desirable that as many cases of the kind as possible should be seen. It did not conform to the type with which the Section had lately been concerned, as there was polycythæmia with enlarged spleen, but no cyanosis, so that it could scarcely be regarded as even an outlying member of the group to which he had referred. It was only by bringing forward such cases into clinical notice when they occurred that it would be possible by degrees to differentiate them.

Dr. ROBERT HUTCHISON said he should not regard the present case as belonging to the group of splenomegalic polycythæmia. He had seen many cases of the present type which were difficult to classify—adolescents who had enlarged spleens, but often very little else. He did not attach much

importance to the polycythæmia in the present case, because it was of such slight degree. There were many people with 6,000,000 red cells to the cubic millimetre. In some of the cases which he investigated a few years ago there was a history of the spleen having been enlarged in infancy, and in some cases the enlargement of the spleen was a survival of that period. In others there was a history of congenital syphilis. Inherited syphilis, with enlargement of the spleen as its only sign, was occasionally seen, just as ulceration of the soft palate sometimes occurred as an isolated late manifestation of inherited syphilis. He was inclined to refer the present case to that group. In reply to the President, Dr. Hutchison said that in the cases in which the splenic enlargement of syphilitic origin had persisted from infancy he had not met with polycythæmia, but there might be a normal number of red corpuscles. He had seen many such cases in whom there was no anæmia.

Dr. PARKES WEBER said that it was hard to account for all the facts in Mr. Hann's case by any diagnosis. The increase in the red blood corpuscles was not sufficient to place the case in the class of splenomegalic polycythæmia, but it might be accounted for as a conservative reaction resulting from relative deficiency in the cardio-vascular system, the heart and blood-vessels being perhaps imperfectly developed in proportion to the length of the body. There was a doubtful history of syphilis, Dr. Weber gathered, in the father, and the child's retarded development and the splenomegaly might possibly both be late manifestations of congenital syphilis. On the other hand, the possibility of splenic tuberculosis had to be considered, and it would be worth while trying the Wolff-Eisner-Calmette test ("ophthalmo-reaction") for tuberculosis. There was likewise the question of the case being an incipient one of Hodgkin's disease, as the glands in both axillæ were considerably enlarged. It was doubtful whether the paroxysmal attacks of abdominal pain were causally connected with the splenomegaly.

A Case of Hemihypertrophy.

By P. LOCKHART MUMMERY, F.R.C.S.

THE patient is a boy, aged 4½. He is the son of healthy parents, and his brother, older than himself, is quite a normal child. I first saw him in December, 1905, when he was brought up to the North-Eastern Hospital for Children because one leg was shorter than its fellow. When the child was stripped for examination it was noticed that the whole of the left side of the child's body was larger than the right side. The mother said he had always been a healthy child. She first noticed that the left side was bigger than the right when the child was aged 1½. The child looks healthy and his mental condition appears to be normal, nor can any abnormality be detected beyond the difference in size of the two sides of the body. When

the child was first seen, two years ago, the difference in the measurements on the two sides of the body were as follow :—

Left lower extremity	...	...	$\frac{3}{4}$ in. longer.
„ upper „	...	...	$\frac{1}{2}$ in. longer.
Girth at umbilicus	...	...	1 in. greater.
„ of chest	...	...	$\frac{3}{4}$ in. greater.

All other measurements were similarly greater on the left side. The left side of the tongue was obviously larger than the right side. An X-ray photograph showed that the bones on the left side were larger than on the right and that the ossification of the epiphyses was more advanced. The right testicle was undescended and smaller than the left.

The case has been under my observation for over two years. During that time the child has remained in good health except for an attack of scarlet fever contracted in the hospital. During the two years, however, the difference in the two sides of the child has increased, or in other words the left side of the child has grown faster than the right. The difference is now much more marked than when he was first seen, and the left half of the child, especially the face, appears at least a year older than the right. Whereas the left lower extremity was only $\frac{3}{4}$ in. longer than the right two years ago, it is now nearly 2 in. longer, and similar differences are apparent in the other comparative measurements. Also it is now obvious that the left orbit and eyeball are larger than the right, while two years ago no difference could be detected.

Both sides of the child appear to be perfectly normal, but to have grown at different rates. To enable the child to walk without a serious limp a thick-soled boot has been fitted to the left leg, and this has had to be increased in thickness several times in the last two years. Even the child's left tonsil is larger than the right.

This condition is an extremely rare and curious one. I have only been able to discover records of 10 other cases of a similar nature, though, of course, local hypertrophy is common enough.

Logan, in 1868, recorded a case in a child, aged 4. The right half of the body was the hypertrophied side.

Tilanus,¹ of Munich, reported a case in 1893. The patient was a girl, aged 10. The left side was affected, and the condition was first noticed at the age of 3.

A remarkable case is reported by M'Gregor, of Glasgow. The patient was a boy, aged 10. The condition was first noticed at the age of 3. The hypertrophy was on the right side and was unequal, as the

¹ Tilanus's and Möbius's cases are undoubtedly the same.

right leg was the part chiefly affected; the head does not seem to have been affected at all. The hypertrophied leg was amputated when the boy was aged $11\frac{1}{2}$, and he died after the operation. Post mortem an enlargement of the right optic thalamus was found. The pituitary body was normal.

Möbius records a case in which the left side was hypertrophied, and measurements taken over a period of eleven years showed no alteration in the difference between the two sides.

Rédard records a case affecting the right side.

Milne has recorded a case. The patient was a girl, aged eighteen months; the right side was affected. There were six teeth on the right side and only one on the left.

Robert Hutchison reported a case in 1904 to the Society for the Study of Diseases in Children. The child was aged four months, and the asymmetry appeared to involve the limbs and trunk only. The child died from broncho-pneumonia, and post mortem it was found that the paired organs were larger and heavier on the left side. Thus the left kidney weighed 56 gm. and the right only 28 gm. The right testicle 2.3 gm. and the left 0.55 gm. The left lobe of the thymus gland was larger than the right.

Cases have also been recorded by Finlayson, Langlet, Broca and Demme. In one or two instances, however, it seems probable that the same case has been recorded by more than one observer.

I have myself seen one other case, a child, aged ten months, a girl. The left side was affected as in the present case, but the difference in the two sides was slight, and I have lost sight of the child for the last two years.

The present case would seem to be one of the best marked cases yet recorded, as the hypertrophy seems to be fairly uniform over the one side. It also brings out one important fact about the disease, namely, that the condition is due to one half of the body growing faster than the other half, and that this unequal growth is progressive. The child, if it lives, must grow into a curve, with the concavity to the right.

Nothing is known about the pathology of the condition. It has been suggested that the condition resembles acromegaly, but no disease of the pituitary body has been discovered in any of the cases. In M'Gregor's case an enlargement of the right optic thalamus was present, but unfortunately no microscopical examination was made, and moreover his case was not quite a typical one, as the hypertrophy was not uniform. The condition would not appear to be fatal, but very serious deformity

would seem inevitable. The condition must, however, be due to some lesion or maldevelopment of the central nervous system, as there is no other system of the body which is strictly bilateral. The disease, or condition, should therefore be, I think, considered as belonging to the diseases of the nervous system and those centres of the brain which govern nutrition and growth. There is apparently, at present, no treatment for the condition.

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Multiple Telangiectases.

By SIDNEY PHILLIPS, M.D.

F., MARRIED, aged 56, subject to free bleeding from both nostrils since childhood; since 1897 bleeding at times from vascular patches on the tongue, and in 1900 bleeding occurred from similar patches on the roof of the mouth; in October, 1907, free epistaxis with bleeding from the tongue and from small nævus-looking spots on the lower lip occurred. The former bleed occasionally when the teeth are cleaned.

Father of patient is subject to violent epistaxis and has some vascular elevations on tongue which bleed at times. Patient's sister died of hæmorrhage from the gums. Patient has one child who has vascular elevations on the tongue, but has bled from them only once. Patient has stigmata on cheeks, and scattered about trunk small red spots size of a pin's head. On lower lip is a small elevated vascular patch which often bleeds, also a smaller one on the upper lip; a red spot on the right little finger. Near the tip of the tongue is a small red elevated patch which at times spurts up blood freely; several others much smaller on surface of tongue, and one red speck behind alveolus of upper jaw, which bleeds freely at times.

All the vascular patches have shrunk considerably since the patient has been in hospital for two months. When admitted they were more full of blood and more prominent.

DISCUSSION.

Dr. COLCOTT FOX said there was at present a case in Westminster Hospital of such multiple telangiectases. He showed a drawing of it sent to him by Dr. John Norton. The case was subsequently admitted by Dr. Hebb, with bleeding from the rectum. The rectal condition had not yet been thoroughly investigated. There was a history of epistaxis dating back for many years, and a sister of the patient had had some similar affection. There were no telangiectases in the mouth or on the face, but they were abundantly present on both sides of the body.

Dr. PHILLIPS, in reply, said it was true that the condition sometimes occurred at advanced ages, and that females were chiefly affected: but the present patient's father had a similar affection.

**Multiple Hereditary Developmental Angiomata (Telangiectases)
of the Skin and Mucous Membranes, with Recurring
Epistaxis.**

By F. PARKES WEBER, M.D.

THE patient, aged 60, is a pale, rather puffy-looking woman, with small red angiomata distributed over the face, ears, lips, tongue, mucous membrane of the mouth, and the conjunctival surfaces of the four eyelids. There are likewise telangiectases inside both nostrils, on the posterior wall of the pharynx, and on the anterior surface of the epiglottis. Some of the angiomata on the face approach the "spider nævus" type seen in patients with cirrhosis of the liver. There are peculiar ophthalmoscopic changes. Both optic discs are rather pale, especially the left one, and the blood-vessels are too thin. In the macular region of the right eye there is a whitish area with a patch of black in its centre, probably the remains of a hæmorrhage. In the region of the macula and outwards in the left eye the retina is dotted with numerous small star-shaped pigment spots, somewhat resembling the change found in cases of retinitis pigmentosa. In the left eye there is likewise a small retinal hæmorrhage.¹ During the last six years the patient has been subject to very frequent epistaxis. The angiomata were first noticed at about the age of 42. There is a history of a similar affection in the patient's mother and in several of the patient's children. Dr. Weber has described the case in full,² and similar cases have been recorded by Professor Osler and others.³

¹ Dr. R. Gruber's ophthalmoscopic examination of November, 1907.

² *Lancet*, 1907, i., p. 160.

³ See especially Osler, *Quar. Journ. of Med.*, Oxf., 1907, i., p. 53.

DISCUSSION.

Dr. C. O. HAWTHORNE said he had recorded a case of this kind, but somewhat incompletely, owing to the fact that the patient could not submit to detailed examination. But there were two points in connection with such cases which should be borne in mind : First, they should be carefully distinguished from cases of ordinary hæmophilia. It would be found that there was nothing in the family history to suggest that there was an undue tendency to bleed, as, for instance, on a tooth being extracted. Secondly, these cases bled not only from the nose, but from small nævoid patches. He ascertained from one of the present patients that she sometimes had bleeding from one of the fingers. He suggested that a patient might have such a patch on the skin apart from any patches which caused bleeding from the mucous membranes. He knew of one case in a woman who had a spot at the end of her thumb, from which she bled frequently, though in her case there was no history of epistaxis.

The PRESIDENT asked whether in the family groups the condition preponderated in females. He understood that in a number of cases the condition came on at a ripe age. He recalled the fact that the occurrence of nævoid conditions all over the trunk in people past the climacteric had been supposed to occur in patients developing malignant disease, but he did not think such spots had been proved to be of any material diagnostic value. All must have seen women past the climacteric who developed small nævoid growths on the trunk which appeared to have no prognostic significance. It would be worth while to enquire into the hereditary tendency in these cases.

Mr. STEPHEN MAYOU said that some years ago he saw a case, which was under the care of Mr. Watson Cheyne, of multiple telangiectases in the bladder, associated with the same condition on the legs. There was hæmaturia of a very profuse character. The eyes were examined, and there was found to be double optic neuritis, which at that time was thought to be due to the anæmia produced by the large hæmorrhages.

Dr. PARKES WEBER, in reply, said he would like to urge that all cases of the kind in the future should have the eyes examined, as in his case there were remarkable ophthalmoscopic appearances.

Case of Complete Transverse Resection of the Pharynx with Laryngectomy for Malignant Growth (Squamous-celled Carcinoma) of the Posterior Pharyngeal Wall.

Shown by W. SAMPSON HANDLEY, M.S.

THE patient, a woman, aged 44, was sent to the Bolingbroke Hospital by Dr. McManus and was transferred to my care by my colleague, Dr. E. A. Peters. For some months she had felt difficulty in swallowing, and on admission even fluids were rejected. She was also

suffering from nocturnal attacks of dyspnoea. She was wasted and miserable, and was willing to take any risk in order to obtain relief.

Bougies were arrested at the level of the thyroid cartilage. A finger introduced into the pharynx came upon a mass of fungating growth entirely filling up its lower outlet. The laryngoscope showed oedema of the ary-epiglottic folds, and although the vocal cords were but slightly congested, it was clear that the growth had attacked the posterior wall of the larynx. No glands could be felt. The larynx and pharynx retained their lateral mobility when grasped externally, though the distension of the pharynx by the growth was obvious on palpation.

A preliminary gastrostomy was performed. A week later, on November 14, 1907, a low tracheotomy was done, the trachea being plugged with gauze above the tube. The patient's shoulders were raised by a pillow, over which her neck was extended, an incision was made along the anterior border of the left sterno-mastoid, and the upper end of the oesophagus was exposed. At the root of the neck it was free from growth, but the healthy portion was not long enough to reach the skin surface. The left lateral incision was prolonged to the mastoid process, and from the angle of the mandible on the right side a second incision was carried downwards and inwards to join the first one at right angles. The skin flaps were dissected up; the sterno-hyoid, sterno-thyroid and thyro-hyoid muscles were separated from their upper attachments. The carotid sheath was exposed and was dissected away from the wall of the pharynx on either side. The two superior laryngeal nerves were sought for and carefully isolated with a view to their preservation if the larynx could be saved. An opening was now made through the thyro-hyoid membrane into the pharynx. The insertion of a finger showed that it would be impossible to separate the growth from the larynx. The growth was also invading the left lobe of the thyroid, behind which a single enlarged gland was found and removed. The incision through the thyro-hyoid membrane was now prolonged backwards on both sides as far as the posterior wall of the pharynx, which was adherent to the longus colli opposite the growth. This adhesion was freed by the finger and by a blunt dissector. The upper division of the pharynx was now completed by cutting across its posterior wall with scissors, well above the growth. The whole mass could now be pulled forward, and was removed by cutting through the trachea and oesophagus as low down as possible, after ligature and division of the isthmus of the thyroid. The infiltrated left lobe of the thyroid was removed in one piece with the larynx and pharynx. The trachea, the oesophagus, and the remaining

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upper part of the pharynx were respectively closed by sutures. A drainage-tube was inserted, lying in the line between the right and left angles of the mandible. The flaps were replaced and the wound sewn up.

There was considerable shock, but convalescence was uninterrupted. The wound healed by primary union, save in the middle line just below the hyoid, where a pharyngeal fistula established itself. Within forty-eight hours the patient expressed herself as feeling better than before the operation. At present, six weeks after the operation, she has gained in weight and her colour has improved. She is, however, somewhat subject to temporary attacks of depression. She can swallow her saliva by means of a rubber funnel, lying behind the tongue and emerging at the subhyoid fistula, to be led into the stomach through the gastrostomy opening. As regards speech, although no air passes through her mouth she can make herself understood in a thin whisper. Sibilants are well pronounced, apparently by expulsion of air contained in the mouth cavity. During the past fortnight she has gained 4 lb. in weight.

Although partial resection of the pharynx has been frequently performed as an incident of laryngectomy, I believe this to be the first recorded case in this country of complete transverse resection of the pharynx. In Germany the operation has been performed by Professor Gluck, of Berlin. The operation is a terrible one, and is to be offered and not urged. It may, however, be pointed out that gastrostomy and tracheotomy combined are no substitute for excision of the growth, even so far as concerns the patient's immediate comfort. The presence of the foul, ulcerating, pharyngeal mass is an obsession on the consciousness of the patient, is a cause of chronic gastritis and malnutrition, and involves a continual risk of broncho-pneumonia.

DISCUSSION.

Mr. HERBERT TILLEY congratulated Mr. Handley on the result of the operation. He said it was always difficult to know what to do with such cases. The growth was evidently very extensive, and it was often asked whether it was worth while to do the operation and leave the patient in the pitiable condition in which the present woman was. That, however, was a matter for the decision of the patient. When the disease was far advanced, starvation was only a matter of weeks; whereas operation had caused a comfortable prolongation of life, in one case to seven years after, so that there was something to recommend it. Ten years ago Dr. Cohen, of Philadelphia, showed the first case in which such an operation had been performed; the whole larynx and part of the pharynx were removed, and there had been an extensive resection of glands in both triangles of the neck. The case was

shown about two years after the operation, and he should not forget the excitement it caused, because the man's whisper could be heard some distance off, and he smoked a cigarette with comfort. In properly selected cases the operation was justifiable, and held out brilliant prospects. The general health of the patient was a great factor in determining the desirability of operation. If the growth was extrinsic, and the patient had any metastatic deposits in distant regions, or if the general health was bad, or if there was bronchitis or renal trouble, the case should not be dealt with in that way. He thought that there was no operation in surgery in which more careful preparation of the patient was necessary, nor more careful after-treatment. Septic pneumonia used nearly always to occur in such cases, and was difficult to prevent. But that risk had been gradually overcome by improved technique and by keeping the patient's mouth as aseptic as possible. He asked whether Mr. Handley had the patient in the Trendelenburg-Rose position, and whether it would not be possible to do a high tracheotomy as a preliminary measure, and to bring the trachea forward and suture into the skin wound. That would have avoided the need for a tracheotomy tube, and if the œsophagus could have been brought into the skin wound, gastrostomy would have been unnecessary.

Mr. R. H. JOCELYN SWAN showed a specimen of carcinoma of the pharynx invading the larynx, which he had removed by a very similar operation. The patient was a man, aged 44, who first noticed a swelling on the right side of his neck about four months before his admission to the Cancer Hospital on December 16 last. This swelling gradually increased in size, and in a short time he noticed some pain and difficulty in swallowing, at first with solid food, and increasing so that he could only take fluids and soft puddings. During the last month his voice became affected, and more recently he noticed difficulty in breathing, especially at nights, when he was frequently awakened with dread of suffocation. He had lost weight. On examination, there was a mass of matted glands on the right side of the neck in the deep cervical group below the sterno-mastoid, and extending upwards and backwards towards the mastoid process. The mass could be moved easily from side to side, was firm and smooth, and not adherent to the skin. No glands were felt enlarged in the posterior triangle or on the left side of the neck. No growth could be seen in the mouth or tongue; but the tip of the finger could reach the upper end of a hard, nodular growth in the right lateral pharyngeal wall at about the level of the epiglottis. He was seen by Mr. Rose, who reported that he found a carcinoma of the right lateral wall of the pharynx which had commenced to infiltrate the right lateral portion of the larynx and right vocal cord. The movements of the tongue were not impaired, but the larynx was distinctly pushed over to the left of the mid-line of the neck. No evidence of metastasis could be found. On December 19, after fully explaining to the patient the nature of the trouble and the ultimate issue, a low tracheotomy and a gastrostomy by Witzel's method were performed as a preliminary to further operation. The patient improved in general health, and on January 1, 1908, removal of the larynx and the lower half of the pharynx, together with the glands in the neck,

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was performed. He was given chloroform by Mr. Chaldecott, when the trachea was plugged and a long Trendelenburg's cannula adjusted to the tracheotomy tube. Flaps were turned back of the skin, platysma, and superficial fascia of the neck, and the glandular mass on the right side exposed. The sterno-mastoid muscle was divided, the carotid sheath opened, and all the glands of the anterior triangle removed, together with the internal jugular vein. On the left side a few small glands were removed and the large vessels exposed and drawn outwards. The sternal muscles were reflected and the superior thyroid arteries of each side ligatured, the lateral lobes of the thyroid being reflected. The thyro-hyoid membrane was now fully exposed and incised on the left side, a good view of the growth being thus obtained. It was then found that the larynx was extensively encroached upon, but that the upper limit of the growth of the right lateral pharyngeal wall was well below the level of the hyoid bone. The lateral and posterior walls of the pharynx were rapidly separated, and the incision below the hyoid bone extended, dividing the pharynx completely at this level. The whole was raised from the prevertebral tissues and removed by dividing the trachea obliquely upwards and backwards immediately above the isthmus of the thyroid and by dividing the œsophagus at the same level. The pharynx was closed above by catgut sutures, uniting the posterior wall with the thyro-hyoid membrane immediately behind the hyoid bone, the upper end of the œsophagus closed by a double layer of sutures and the upper end of the trachea united to the skin by fine silkworm-gut sutures. All bleeding was arrested, and the skin flaps were united by thread sutures, ample provision being made for drainage. The operation, which lasted one and a half hours, was well borne, the pulse remaining good throughout. The patient did well for three days, the cervical wounds remaining clean, feeding being carried out by the gastrostomy opening. On the fourth day he was troubled with cough, bringing up slightly blood-stained expectoration, and fine râles were heard at the base of each lung. Temperature rose to 102° F., and he was slightly cyanosed. He continued in same condition until January 7, when he collapsed, rapidly lost ground, and died. An autopsy was made by Drs. Paine and Morgan, when the cervical wounds were found healthy, except in the central portion, where a septic tract led from the drainage-tube to the pharyngeal sutures, which had in part given way. There was no inflammatory spread in the triangles of the neck or in the superior mediastinum, where the cellular tissue was normal. There was marked septic broncho-pneumonia of the bases of both lungs, with a small, foul abscess cavity on the left side. The liver was fatty. Mr. Swan agreed that the operation was a severe one, but that it was quite justifiable, provided that the patient fully understood the ultimate result of removal of the whole larynx and part of the pharynx. That broncho-pneumonia was a severe danger was undoubted, as in his case, in spite of a preliminary tracheotomy and plugging of the trachea during the operation. He was convinced that no blood entered the trachea during the operation, whilst subsequently the upper end was covered and sometimes lightly packed with sterile gauze. He considered it better to suture the trachea to the skin wound than to leave a permanent tracheotomy tube. The

specimen showed an oval-shaped epitheliomatous ulcer of the right lateral pharyngeal wall which was directly invading the larynx in the immediate vicinity of the right vocal cord, and considerably diminishing the air passage.

Mr. HANDLEY, in reply, said that Mr. Tilley's remarks applied rather to cancer of the larynx than to cancer of the pharynx. He did not know whether Dr. Solis Cohen's case involved the removal of the whole cross-section of the pharynx or whether only the anterior part of the pharynx was removed.

Mr. TILLEY replied that the lateral wall of the pharynx on one side was removed, and there was a very extensive growth within the larynx.

Mr. HANDLEY said the case referred to was therefore not entirely analogous to the present one, in which the whole cross-section was removed over the lower half. The patient was in the ordinary position, but with the shoulders raised on a pillow, and he was very careful to plug the trachea above the tracheotomy tube, so that he was not afraid of blood getting into the lungs. Considering the severity of the operation, there was very little shock. The growth extended so low that it would have been impossible to do a high tracheotomy. It involved the upper end of the œsophagus, and he had to divide the œsophagus as low as he could reach, almost down to the suprasternal notch. For the same reason it was impossible to bring the œsophagus up to the skin. He thought Dr. Swan's case was a more unfavourable case than his own because of the number of enlarged glands. The prognosis after such operations was largely dependent upon whether the carotid sheath had to be opened or not. He had done the same operation in a second case, but with a fatal result. The patient died on the table, apparently from the irritation of the vagus, after the operation was practically complete. He believed that it was due to a defect in his technique, and that if he had frozen the two vagi below the point at which he was working, death would not have occurred.

Congenital Absence of Left Pectoral Muscles.

By J. GRAHAM FORBES, M.D.

MALE, aged 47, stickmaker; under treatment since childhood for chronic bronchitis. Until a year ago his attention had never been drawn to the defective muscular development of the left side of the chest, and his parents noticed nothing abnormal. No history of infantile paralysis. Parents, brothers and sisters and children all normally developed. When young he was able to take part in the usual games, but was not athletic. Has apparently experienced no inconvenience from the loss of the left pectoral muscles, and attributes the greater strength of the right arm to its almost exclusive use in his work.

Patient is below medium height and of spare build. The chest shows marked want of symmetry of the two sides, owing to the absence of the sternal portion of the left pectoralis major and the whole of the

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left pectoralis minor. Only the clavicular attachment of the pectoralis major and a small band passing to the first costal cartilage persist. The former is hypertrophied and both are brought into relief by abduction of the arm and flexion at the elbow.

The left side is much flattened, the first and sixth ribs and intercostal spaces are only covered by a layer of thin smooth skin, and the anterior fold of the axilla is missing. Extension and abduction of the arms bring the pterygoid fold of skin into prominence as a fine ridge running downwards along the line of the missing axillary fold, disappearing on bringing the arms to the side, and apparently not composed of muscle fibres. The left nipple is normal in appearance and position. The sternum is deviated slightly to the right and forwards, the lower end forms a sharp projection with the xiphoid cartilage directed backwards. There is no defect in formation of the left costal cartilages. No other muscles than the left pectorals are deficient. The poorer muscular development of the left arm and hand is probably due to the almost exclusive use of the right in the course of work; at the same time the movements of the left upper limb are perfect. Percussion of the thorax show hyper-resonance of the left side, and on auscultation sibili are audible over both lungs. Though his attention has only been drawn to the absence of the left pectoral muscles during the last year, the defect is probably congenital. There is no evidence in the history to point to infantile paralysis, and, as no other muscles are wanting, the condition is not likely to be a form of myopathy.

Remarks.—Records of some 65 to 70 cases of unilateral absence of both pectoral muscles exist. In the majority, as in the case shown, the hypertrophied clavicular portion of pectoralis major only remains, with occasionally a few rudimentary fascicles of the sternal portion. The skin covering the affected side often shows trophic changes, being smooth and thinned and sometimes adherent to the ribs, and the nipple may be undeveloped. The deficiency is usually on the left, and seems to occur more often in males. It proves no hindrance to laborious occupation and athletic pursuits, such as boxing and swimming. In several cases recorded in France the patients were able to perform military service without exemption or inconvenience: the condition may pass unnoticed until medical advice is sought for some ordinary complaint.

Associated Anomalies.—(1) Absence of other muscles, such as latissimus dorsi, serratus magnus and teres major. (2) Defective development of costal cartilages sufficient to allow hernia of the lung on forced

inspiration, as in case recorded by Jonathan Hutchinson.¹ (3) Deformities and mal-development of the corresponding arm and hand.

A remarkable case described by Reboul² is the only one recorded of *bilateral* absence of pectoral muscles, associated with undeveloped sternomastoid and anterior neck muscles.

The patient, in other respects a powerful, muscular man, was capable of lifting and supporting heavy weights. There was marked kyphosis, the head being carried well forward in the attitude characteristic of the chimpanzee, while the front of the chest was much sunken.

Etiology.—Several explanations have been put forward to account for this rare anomaly. (1) Arrest of development of the blood-vessels and nerve supply (peripheral or central) to affected muscles; not supported by dissections made of cases post mortem. (2) Physical deterioration (Widal and Lemièrè). Unsupported by the good physique presented in many cases. (3) Retrogression to the normal state existing in certain mammals, *e.g.*, the porcupine and guenon monkey, which have no clavicles (Testut). This view cannot be applied to the majority of cases showing persistence of the clavicular head of pectoralis major. (4) Intra-uterine foetal paralysis (Berger), only affecting the pectoral muscles; unsupported by post-mortem evidence. (5) Intra-uterine pressure. Froriep in 1839 ascribed the anomaly to the influence of localized intra-uterine pressure, which, by forcibly compressing the foetal upper limb against the thorax, prevented the development of the underlying muscles. As a further result grooving of the chest wall by the apposed limb, together with malformation of the arm and hand, have been recorded in a few cases met with in infancy and early childhood.³ The absence of a thoracic depression in adults may be due to obliteration of the groove by the further growth of the chest wall. Pressure would also account for atrophy of the skin and nipple and defective development of the costal cartilages.

This explanation of Froriep receives the support of the majority of authors. Reboul adopts it to explain his case of bilateral absence of the pectoral muscles; he supposes that, in addition to compression of both sides of the thorax by the upper limbs, the pressure of the chin of the foetal head inclined forwards accounts for the undeveloped condition of the anterior neck muscles. It is reasonable to apply this theory to explain other congenital muscular deficiencies, *e.g.*, absence of the

¹ *Arch. Surg.*, Lond., 1894, v., p. 342.

² *Rev. d'orthopédie*, Paris, 1905, vi., p. 353.

³ Souques, A., *Rev. neurol.*, Paris, 1902, x., p. 159.

abdominal muscles, possibly produced by pressure of the flexed lower limbs on the abdomen of the foetus *in utero*.

DISCUSSION.

Mr. RAYMOND JOHNSON said that he had shown a similar case before the Clinical Society five years ago, the patient being a boy with absence of the pectoral muscles on the right side. The case differed from the present one in two respects: (1) that there was a very broad fold of skin from the side of the chest down the inner side of the arm to the internal condyle, with a band of muscle in its free edge, a so-called chondro-epitrochlaris. He showed it as a case of webbed arm and fingers associated with absence of pectoral muscles. There were a few fibres of the clavicular portion present. In Germany a considerable number of cases had been recorded in which there was an absence of pectoral muscles associated with webbing of the fingers and the presence of a fold of skin from the chest to the inner side of the arm. In the present case the left scapula was higher than the right; in his own case the difference in that respect was very striking. It was difficult to imagine that such a defect was the result of pressure, especially when the absence of muscles was associated with webbing.

Dr. G. A. SUTHERLAND thought that the pressure theory was probably the correct one in the present case, and that one might exclude a nervous or vascular lesion because the atrophy was so limited to a certain area of the body, and involved all the structures of the part. In only a small proportion of the cases was there an affection of hands or fingers, and if there was pressure of the hand sufficient to cause such injury, on the principle that pressure and counter-pressure were equal and opposite, one would expect that the part pressing on the chest ought to be affected also. There was an interesting parallel in a certain condition of the abdomen in which there was a congenital absence of certain parts of the muscular wall in the right or left hypochondrium, which had been traced to pressure upwards of one or other knee. All the structures in the abdominal wall were atrophied, and as a result, when the patient coughed or strained there was a ballooning of the abdominal wall at the part affected.

Dr. FORBES, in reply, said there were one or two cases on record in which there was a definite grooving of the chest wall corresponding to the position of the limb *in utero*.

Meningitis complicating Otitis media, with Lumbar Puncture.

By A. E. BARKER, F.R.C.S.

THE case of C. W., aged 31, is shown to emphasise the point that lumbar puncture may be of *remedial* as well as of diagnostic value. The patient's condition at the time when the meningitis was found in the

temporal region was almost hopeless, and when thick, greenish, turbid fluid was drawn off at the same time from the lumbar sac the prognosis was not improved. Continued drainage through the temporal wound and lumbar tapping of 20 c.c., repeated about every two days at first, was followed by steady improvement and ultimately by convalescence. Fourteen tapings were made in all. The first, soon after admission, was normal: the next were thick, turbid, greenish and swarmed with *Micrococcus catarrhalis* and leucocytes in all forms. Very soon the fluid became clear and sterile.

A Case of Multiple Subcutaneous Rheumatic Nodules.

By HERBERT FRENCH, M.D.

THE patient, H. K., aged 20, has upwards of 150 well-marked subcutaneous nodules, some no larger than split peas, others as big as small beans. The latter project from the general level of the skin surface so as to be visible from a distance. They are scattered over the backs of the hands, knuckles and fingers, the extensor surfaces of the forearms, the elbows, the knees, on the scalp and in the abdominal fasciæ. There are none on the feet, nor over the malleoli nor elsewhere. The youth had his first attack of rheumatic fever three years ago, and at that time developed similar subcutaneous nodules which disappeared in a fortnight. He had his second attack of rheumatic fever in July, 1907, when he was laid up in Guy's Hospital until the middle of October, 1907. The attack was very severe, and left him with double aortic and double mitral bruits, which are well heard. The heart is moderately compensated. The nodules now present developed during this second attack of rheumatic fever; and instead of disappearing, as they did after the first attack, they have persisted almost unaltered until now—a period of six months.

Case of Fatal Acute Illness in a Child from Status lymphaticus.

By SIDNEY PHILLIPS, M.D.

W. P., a boy, aged 5½, was stated by his mother to have always had good health, and to have been quite free from any sign of illness until October 12, 1906, when his breathing began to be noisy and difficult. He was at once taken to a doctor, and afterwards remained under medical treatment at home, though not in bed, as his breathing became worse in the recumbent position; probably for this reason it was worse

at night, sometimes so bad that he rose up screaming; the breathlessness increased day by day, and he came into St. Mary's Hospital on October 15. I saw him the same afternoon; he was a well-developed, well-nourished boy, propped up in bed, gasping for breath in great distress. The respirations were 36 per minute, and with each inspiration there were three sounds, very like a hiccough thrice repeated; the first of the three sounds was louder than the other two, which were separated from one another by a shorter interval than from the first sound; the effect is best represented by uttering the sounds "hich-hichee." There was marked contraction of the platysma muscle and drawing downwards of the lower jaw with each inspiration, and marked sinking in of the epigastric and supraclavicular regions. The boy was too breathless to speak much, but when he shrieked out, as he did at times in his extreme distress, the voice was quite clear. He was pale rather than cyanotic, and his extremities were not cold; the pulse was feeble and small; the temperature normal; at times he came out in a clammy sweat. There was moderate chronic enlargement of the tonsils. I could find nothing abnormal in the larynx, nor could my colleague, Dr. Scanes Spicer, who kindly examined him; the vocal cords moved freely. There was nothing wrong detectable in the lungs, though the breath sounds were weak over both sides of the chest.

Dr. Simmonds, at my request, examined him with Röntgen rays, by means of the screen, but there was no sign of any foreign body in the air passages. He had been sent into hospital for diphtheria, but there were no signs of membrane anywhere. It was clear the breathlessness was not due to laryngeal or to pulmonary disease. The peculiar character and sounds of the breathing were much like those sometimes observed in hysterical girls, but the condition here was much too grave to attribute merely to a neurosis. There was a suspicion of some want of percussion resonance over the sternum, and I concluded that the dyspnoea probably arose from pressure on the air passages in the mediastinum. Not at the time thinking of the thymus gland, I thought such pressure probably arose from enlarged lymphatic glands about the tracheal bifurcation, or even their ulceration into a bronchus as in the case recorded by Mr. R. W. Parker.¹

Tracheotomy in such a case could be of no avail, and all that could be done was to administer a little morphia, which gave some temporary relief. I saw him again at 10 p.m., but the distress was as great as ever and the pulse weaker. He died during the night, apparently from heart failure.

¹ *Trans. Clin. Soc. Lond.*, 1891, xxiv., p. 6.

The autopsy was made next day by Dr. Spilsbury, and nothing was found wrong in any organ of the body, except an enlargement of the thymus gland and certain changes in the spleen and lymphatic glands, which are described by Dr. Spilsbury as follows: Thymus, weight $\frac{3}{4}$ oz. The thymus consisted of two lateral lobes, closely apposed but not united; it extended from the lower border of the thyroid body downwards into the mediastinum, its lower part coming into close relationship with the pericardium. The surface of the organ was lobulated, and on section it was fairly firm.

Histology.—Thymus showed hyperplasia of the lymphoid tissue, which extended outwards into the neighbouring areolar tissue and inwards into the medulla of the lobules. The medulla and the cortex were therefore indistinctly marked off from each other. Coarsely granular eosinophilous leucocytes were present in large numbers. Hassell's corpuscles were numerous and large. Mesenteric lymph gland showed simple hyperplasia. The lymph nodes were large, and in some places two were fused together. The gland was well supplied with blood-vessels. Spleen showed enlargement of the Malpighian bodies, due to hyperplasia. The spleen pulp was extremely congested and showed considerable deposit of pigment, in the form of fine granules, both inside the cells of the spleen pulp and lying free. Liver showed early nutmeg congestion and slight fatty degeneration. There seemed to be no accumulation of pigment in this organ.

Remarks.—The case seems to be an example of the affection at one time spoken of as "thymic asthma" and more recently as "lymphatism" or the "status lymphaticus." Cases of unexpected death in young infants, apparently from cardiac failure, after attacks of dyspnoea with or without convulsions, in which no abnormality has been found post mortem, except enlargement of the thymus and lymphatic glands, have frequently been recorded.

Grawitz¹ records the case of a child, aged eight months, found dead in bed without any previous sign of illness, and a second case of a child, aged six months, which died in its father's arms after a few moments of illness; in each of these cases the thymus gland was found greatly enlarged post mortem, and in the second of the cases there was also enlargement of spleen and mesenteric glands.

Jacobi² records the sudden death of a child, aged six months, which, after autopsy, he could only attribute to enlargement of the thymus gland.

¹ *Deutsch. med. Wochens.*, 1888, xiv., p. 429.

² *Trans. Assoc. Amer. Phys.*, Philad., 1888, iii., p. 300.

Dr. Crozier Griffith, in the same publication for the year 1903, gives notes of a case of a child, aged seven months, and of a child, aged six months, both of whom died suddenly, apparently of syncope, after sudden difficulty in breathing. Each of these children had had convulsions, though not at the time of the fatal illness, and instances in which sudden death with dyspnœal attacks has been found associated with enlargement of the thymus and the lymphatic glands are so numerous that it has been concluded that there is more than mere coincidence. Death in these cases has been attributed to laryngo-spasm, but laryngismus stridulus does not, I think, kill off infants in this sudden way, certainly not a child of the age of my patient; and in none of the recorded cases is there any mention of the characteristic crowing breathing; death, too, has appeared always to have resulted from cardiac failure. The theory of laryngo-spasm appears to have been put forward in default of any better explanation at a time before the changes had been observed in the thymus and lymphatic glands

Death has been attributed to pressure upon the trachea by the enlarged thymus gland. Marfan¹ found the trachea flattened and its calibre narrowed in an infant, aged two and a half months, which died with an enlarged thymus gland. Koenig,² Perrucker,³ and Siegle have each recorded a case in which, after the enlarged thymus gland had been raised from over the trachea by operation the symptoms were relieved. These cases go to disprove Friedleben's statement that it is impossible for the trachea to be compressed by the thymus gland. Nevertheless, pressure is not the cause of the dyspnœa in the majority of the cases, for in most of them the thymus gland is but slightly enlarged, and no signs of pressure upon the trachea are found; and as Crozier Griffith remarks, if the symptoms arose from pressure they would not come on so suddenly as they do.

Paltauf⁴ advanced the theory that the enlargement of the thymus and lymphatic glands of the body were evidences of a constitutional state in which sudden cessation of the heart's action may occur from very slight causes—among others, administration of anæsthetics. This theory is supported by Escherich, and it is suggested that the symptoms arise from a toxæmia, the result of an over-secretion of the thymus gland, and the affection has been called thymic asthma. More recently Blumer⁵ has suggested that the toxin is not necessarily the

¹ *Bull. et mém. Soc. méd. des hôp. de Paris*, 1894, xi., p. 361.

² *Zentralbl. f. Chir.*, Leipz., 1897, xxiv., p. 605.

³ *Gaz. hebdomadaire de méd.*, Paris, 1899, p. 695.

⁴ *Wien. klin. Wochenschr.*, 1889, ii., p. 877, and ix., 1898.

⁵ *Trans. Assoc. Amer. Phys.*, Philad., 1903, xviii., p. 253.

thymus secretion, but arises also from the lymphatic glands—is, in fact, a lymphotoxæmia. There is still much doubt on the subject, and even if the affection is toxic it is open to question whether the lymphatic gland enlargement itself is not a result of some toxin possibly absorbed from the alimentary tract. In my case the boy, being aged 5, was able to struggle against his breathlessness for some three days instead of succumbing at once, as was the case in young infants. During these three days his symptoms were certainly not due to laryngeal spasm, and the necropsy showed they were not due to any pressure by the thymus gland. They seemed certainly more like toxic symptoms than anything else, in fact, were not unlike those sometimes seen in what has been called uræmic asthma. And I think the case may be deemed worthy of record in this Section, as the history may perhaps be of use in affording a clue to the cause of sudden dyspnœa in cases that may occur in the future.

DISCUSSION.

Dr. POYNTON said he had seen two similar cases, and in them there were two clinical features of interest. There was very marked dulness over the manubrium sterni, and the child died suddenly and unexpectedly. Post mortem it was found that the dulness was due to a very large thymus. The second case had been diagnosed as whooping-cough because of the curious paroxysmal cough. The possibility of the presence of a retropharyngeal abscess as the cause of the symptoms had also to be considered. The second child also died unexpectedly, and very much the same condition was found as had been so often described in such cases.

Dr. BERNSTEIN thought one ought to accept the diagnosis of status lymphaticus with some suspicion. Ever since that diagnosis had been brought forward so frequently, especially in coroners' courts, he noticed that one often found the conditions which were described as "status lymphaticus" in association with an enlarged thymus and an increase of lymphoid tissue elsewhere. Yet the clinical history did not give symptoms attributable to such enlargement, death having been due to other causes. He considered that it had still to be proved that the association of sudden death without dyspnœa with lymphoid enlargements was more than a coincidence. In many of the cases the diagnosis "status lymphaticus" was merely a euphemism.

Dr. G. A. SUTHERLAND said the case recalled one which he had seen of a child, aged 3, who had marked symptoms of obstructed breathing, which he localised in some part of the trachea. There was also well-marked dulness behind the sternum. Above the sternum there was a small, soft swelling, which he concluded to be the thymus, and he attributed the dyspnœa to the pressure exerted thereby. He suggested to a surgical colleague that he should remove the upper part of the sternum, to relieve the pressure of the thymus, but no operation was performed. Dr. Sutherland thought that there were

certain cases in which the thymus was enlarged and yet the condition was not one of status lymphaticus. Dr. Phillips had said that in his case there was no evidence of the trachea having been pressed upon, but Dr. Sutherland considered that the absence of signs of compression after death did not exclude its having been present in life. Possibly there might be irritation of the nerves, producing spasm of the trachea. He was surprised to hear Dr. Phillips compare the condition with uræmic dyspnœa, because he understood that there was marked tracheal stridor present, the absence of which was a characteristic of uræmic dyspnœa. In this case there must have been some stenosis of the trachea. Cardiac failure was a common cause of death in status lymphaticus, but such failure was sudden. Dr. Phillips' patient had suffered from obstructed breathing for several days, and he should say that death was due to this cause, the cardiac failure being merely the terminal event.

Dr. A. E. RUSSELL said that in many children found dead or dying suddenly there was a considerable increase in the weight of the thymus. Dr. Dudgeon published, four years ago, a paper giving particulars of 17 cases, collected at Shadwell and St. Thomas's Hospitals, in which children died suddenly or were found dead. The average weight of the thymus in these cases was 25 grm., the normal weight for children of the same age being 5 grm. to 10 grm. All the children in question were under two years of age.

Dr. PHILLIPS, in reply, said that he could not attribute the symptoms to spasmodic occlusion of the trachea. The child was five and a half years old, so that its trachea had firm cartilage in it, and he did not think that any spasmodic contraction sufficient to cause death could have occurred. Laryngeal spasm had been excluded by the fact that Dr. Scanes Spicer and he found the cords moving well, and therefore the dyspnœa was not due to pressure on the recurrent laryngeal nerve. Death occurred from cardiac failure, breathing continuing after the heart stopped. He was not wedded to the theory of status lymphaticus; but the speaker, who objected to the term, did not suggest any other cause for the child's death. Post mortem nothing was found wrong with the heart or lungs, and there was no tracheal narrowing, and it was suggested that death resulted from some form of toxæmia. The symptoms were remarkably like those of a toxæmia and more closely resembled the gasping respirations of uræmic patients than anything he had seen. As to whether the symptoms were due to the enlarged thymus, everyone must judge for himself. He had not been able to mention all the evidence in favour of this interpretation, but there were scores of cases in which death was due to enlarged thymus, and he thought that it was a factor in the present case.

Report on Case previously shown.

Dr. FORBES showed the specimen of gouty olecranon-bursa removed from the patient exhibited at the last meeting (p. 53). The man made a complete recovery, and the wound healed by first intention. Cultures made from the bursa proved sterile.

Clinical Section.

February 14, 1908.

Sir THOMAS BARLOW, Bt., K.C.V.O., President of the Section, in the Chair.

Note on Two Cases of Gaertner Infection (*Bacillus enteritidis*) in Infants.

By FREDERICK E. BATTEN, M.D., and J. GRAHAM FORBES, M.D.

THE frequency or rarity of typhoid infection in infants is a subject on which there is a considerable difference of opinion. Certainly in London the disease as affecting infants below the age of 2 years is very rare. In a ward of twelve beds devoted to the treatment of infants suffering from infantile diarrhoea—in which, during a period of six months, there were 134 cases—no case of known typhoid infection occurred. Two cases of prolonged fever and diarrhoea occurred; the first, though repeatedly tested, gave a negative Widal reaction, and at the time of death showed no evidence of typhoid infection, but on examination of the stools by Dr. H. de R. Morgan, at the Lister Institute, Gaertner's *Bacillus enteritidis* was isolated. The second gave a negative Widal reaction, but a positive reaction to Gaertner; the child died, and at the autopsy ulceration of the mucous membrane in the small intestine, and especially in the region of the ileo-cæcal valve, was present.

The bacteriological evidence in this second case is complete. The following is the history of the case:—

An infant, C. B., aged 1, who had been delicate from birth, and had been previously admitted into the Children's Hospital in February, 1906, with "wasting and convulsions," and was discharged eighteen days later much improved, was again admitted on October 1, 1906. He had been breast-fed for three months, and after that time

given cow's milk and barley water. There were four other children alive and four had died in infancy. The present illness began with diarrhoea ten days before admission to the hospital on October 1, 1906. The bowels had been moved seven or eight times a day, and the motions had been green and slimy. The child had vomited frequently.

On admission the child was collapsed, with sunken eyes and cold extremities; under suitable treatment the child recovered from this condition, and on examination was seen to be a very wasted child, weighing 11½ lb. The abdomen was distended and the spleen was slightly enlarged. The motions were green and offensive and contained mucus. On admission there was nothing to suggest that the case was other than an acute diarrhoea supervening on a chronic condition of intestinal catarrh. After being fed for twenty-four hours with albumen water and brandy the child was given 1 oz. of "lactated" milk with equal quantities of water every

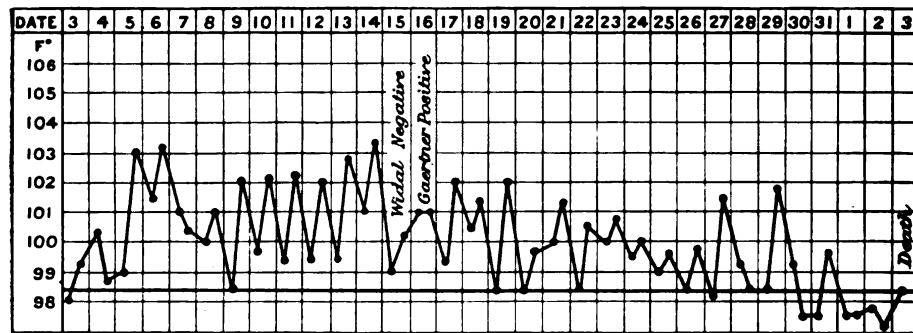


FIG. 1.

two hours. Three days later the child seemed much better; he had not vomited and the motions had greatly improved in appearance, but still contained some curd. Peptonised milk was now substituted for the "lactated" milk. The temperature now began to rise, and for the next three weeks kept persistently above the normal, varying from about 99° F. in the morning to 102° F. to 103° F. in the evening (fig. 1).

On October 6 a purpuric rash developed over the abdomen and chest. During the period from October 7 to October 19 the child did not vomit, the diarrhoea was more severe, and the weight remained stationary at 11 lb. On October 16, the sixteenth day after admission and the twenty-sixth after the onset of the disease, the blood was examined for a Widal reaction with a negative result. No cause for the persistent high temperature could be found.

On October 19, thanks to the kindness of Dr. William E. Marshall, of the Lister Institute, the blood was tested with the *Bacillus enteritidis* (Gaertner) and gave complete agglutination in half an hour in dilution of 1 in 100. Normal serum gave partial agglutination in half an hour in dilution of 1 in 20, and no agglutination in half an hour in dilution of 1 in 50 or 1 in 100. It was noticed at this time that the urine was offensive, but it contained no pus, no albumin or blood. No bacteriological examination was made. The further course of the disease was uneventful. The temperature began to fall, and on October 24 the child was transferred to Dr. Garrod's care as my ward was closed. The child continued to have diarrhoea, to lose weight, and died on November 4, after being thirty-five days under observation. At the autopsy the following condition was found: The brain and thoracic organs presented nothing abnormal. The liver and spleen appeared normal to the naked eye. The stomach and duodenum appeared normal; small ulcers were present in the small intestine some few inches below the duodenum. The ulcers were all small, circular in shape, having a diameter of about $\frac{1}{4}$ in. with irregular edge and varying depth, irregularly placed at any part of the intestinal circumference; one or two were almost down to the peritoneal coat. Some of them appeared to have a minute slough. There was one well-marked area with numerous ulcers about 2 in. above the ileo-cæcal valve. Peyer's patches were swollen but not ulcerated. Some 150 to 200 ulcers were present. The large intestine was normal.

On *microscopical examination* the following changes were found in the viscera: Heart: showed slight fatty infiltration of the muscle fibres. Lung: showed well-marked areas of broncho-pneumonia, many alveoli plugged with cells and blood-corpuscles, others emphysematous, distended and empty, alveolar capillaries congested; the pleura was thickened. Liver: showed much fatty infiltration, chiefly of the periphery of the lobules, causing destruction and compression of numerous liver-cells. Spleen: congested; capsule and trabeculae somewhat thickened; Malpighian corpuscles well defined. Kidney: cortex congested, convoluted tubules show cloudy swelling and fatty changes in the epithelium. Many tubules contained hyaline debris, and some glomeruli showed cell exudation under their capsules. Mesenteric glands: congested; active lymph-cell proliferation and areas of necrotic cells in the cortex. Intestine (small): showed well-marked ulceration with sloping margin extending to circular muscle coat, which formed the base underlying a layer of inflammatory cells, which had also invaded the circular and longitudinal muscle coats extending through to the thickened peritoneum.

The mucous coat for some distance on each side of the ulceration was invaded and thickened by inflammatory cells, and the capillaries of the submucosa were congested.

The *bacteriological examination* may shortly be stated as follows (the full examination with details is added as an appendix to the note): The growth obtained was a Gram negative motile bacillus. This was obtained in pure culture from the spleen, the mesenteric glands, and in a mixed growth from the heart's blood. The bile was sterile. Subcultures were made on a series of media and the organism gave the characteristic reaction of the *Bacillus enteritidis* of Gaertner. Experiments on animals were kindly carried out by Dr. Klein and Dr. Thursfield, which confirmed the above observation. Dr. Klein kindly supplied the blood-serum of a rabbit rendered immune to Gaertner's bacillus and a number of agglutination tests were applied to the original cultures; these showed agglutination in dilution of 1 in 50 in twenty minutes, becoming complete in one hour.

The second case is that of a girl, aged 1, admitted to the Children's Hospital on July 16, 1906, with a history of diarrhoea and vomiting for one week. The child had been fed during the daytime with bread and milk at a "nursery" and by the breast at night when the mother returned from work. On admission the child was very collapsed, with sunken eyes, feeble pulse and cold extremities, and a temperature of 100° F. During the next twenty-four hours the child vomited three times and passed eight motions. On physical examination nothing abnormal could be detected. The child's general condition improved after the second day, the vomiting stopped and the motions became much less frequent. The temperature, however, still remained high, varying between 100° F. and 102° F. (fig. 2). On July 24, sixteen days after the onset of the illness and nine days after admission to the hospital, the Widal reaction was negative. This was again repeated on July 30, with a similar negative result. The temperature now varied between 101° F. and 103° F. The pulse-rate increased and the respiration became more rapid. On August 7 some crepitations were present at both bases and the child developed some cerebral symptoms, viz., stiffness of the neck, a slight squint, and tremor of the arms. The optic discs were normal. It was considered probable that the case was one of tuberculosis, and the cerebral symptoms pointed to tuberculous meningitis.

Three days later (August 10) purpura developed on the abdomen, and the child died on August 11, four weeks after admission to the hospital. On post-mortem examination nothing was found to account for the

child's illness or death. The brain, lungs and heart appeared normal. The liver was somewhat enlarged and fatty. The spleen was also slightly enlarged. Covering the mucosa of the stomach for about half of its area was a membranous white structure which could for the most part be peeled off the mucosa. In some areas it was rather more adherent and the mucosa appeared congested. The duodenum and intestine were perfectly normal; no sign of inflammation of the Peyer's patches was present. Mesenteric glands were large, soft and white; microscopically the liver showed fatty changes. Dr. H. de R. Morgan examined the stools and isolated Gaertner's bacillus.

But few comments are needed on these cases. The first was clinically known to be a case of poisoning by *Bacillus enteritidis* and has been proved to be so both pathologically and bacteriologically. The second case is incomplete in that the organism was only isolated from the stools

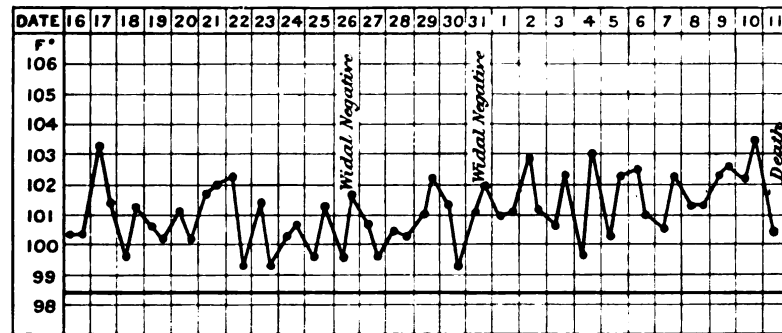


FIG. 2.

and no blood reaction was obtained; still I think that this also was a case of Gaertner's infection, since the absence of the Widal reaction and the presence of the Gaertner bacillus in the stools make it probable that the infection was of that nature. Purpura was present in both cases, in the first one early in the disease, in the second case practically as a terminal manifestation. The cerebral symptoms which developed suggested tuberculous meningitis, and at the time of death the opinion was held that the case was one of tuberculous infection. In what way these two children became infected must remain doubtful, since it was obviously impossible to trace the milk or food supply in these cases. Appended are two temperature charts, which show the type of fever.

TABLE SHOWING CULTURAL DIFFERENTIATION OF *BACILLUS ENTERITIDIS* (GAERTNER), *BACILLUS COLI COMMUNIS* AND *BACILLUS TYPHOSUS*,
AND *BACILLUS PARATYPHOSUS* (A AND B).

Culture media	Agar-agar slope	Gelatin slope	Glucose gelatine shake	Litmus milk	Neutral red broth	Peptone salt solution	Lactose litmus broth (with Durham's tube)	McConkey's fluid (with Durham's tube)	Conradi-Drigalski's plates	Potato
<i>Bacillus enteritidis</i> (Gaertner). Growths obtained from heart's blood, spleen, and mesenteric gland of patient and from heart's blood of inoculated guinea-pig	Thick whitish grey film, brown by transmitted light	Thick whitish grey film	Abundant gas formation (40 bubbles of gas in 18 hours)	No coagulation; after 24 hours faint acid reaction; after 48 hours bluish grey rim; 7-14 days deep greyish blue; colour permanent	Fluorescence	No indol formation	At first faint acid reaction; later alkaline, with gas formation in tube	Acid reaction; gas formation in tube	Growth of blue colonies	Thick whitish yellow film.
<i>Bacillus coli communis</i>	Thick whitish grey film, brown by transmitted light	Thick opaque whitish grey film	Abundant gas formation	Coagulation; acid reaction	Fluorescence	Indol formation	Acid reaction; gas formation in tube	Acid reaction; gas formation in tube	Red colonies	Thick light brown film.
<i>Bacillus typhosus</i>	Whitish blue opalescent film	Semi-transparent whitish blue film	No gas formation	No coagulation; usually no acid reaction; neutral tint, becoming alkaline after some weeks	Usually no change	No indol formation	Usually no acid reaction; no gas formation	Usually no acid reaction; no gas formation	Blue or neutral colonies	Faintly visible growth, glistening surface.
<i>Bacillus paratyphosus</i> (A)	Thick whitish grey film	Opaque whitish grey film	Slow gas formation (15 bubbles of gas in 48 hours)	No coagulation; remaining neutral or faintly acid; becoming clear and an indefinite red after some weeks	No change in 48 hours; later fluorescence	No indol formation	Neutral; no gas formation	Acid; scanty gas formation in tube	Blue colonies	Faintly visible film.
<i>Bacillus paratyphosus</i> (B)	Thick whitish grey film	Opaque whitish grey film	Very slow gas formation (8 bubbles of gas in 48 hours)	No coagulation; colour changes as paratyphoid (A), but becoming alkaline after 10 days; later clear and indefinite red	Fluorescence in less than 24 hours	No indol formation	Neutral or faintly acid; scanty gas formation	Acid; scanty gas formation	Blue colonies	Glistening white film.

APPENDIX.

Bacteriological and Pathological Report on Case I.—Heart blood: Cultures on agar-agar and in broth yielded a mixed growth of cocci and Gram negative and positive bacilli. On subculture a pure growth was obtained on agar of a Gram negative motile bacillus, which was submitted to further subculture tests. Spleen: Stab cultures from the spleen yielded a pure growth on agar of a Gram negative motile bacillus. Mesenteric gland: small portions were removed from the centre of the gland with every sterile precaution and incubated in a broth tube. The culture obtained proved to be a pure growth of a Gram negative motile bacillus. Bile: proved sterile in culture. Subculture tests were applied to the growths obtained from the heart blood, spleen and mesenteric gland, in litmus milk, peptone salt solution, neutral red broth, glucose gelatine shake, and on gelatine and agar-agar slopes; lactose broth, McConkey's fluid containing Durham's tubes, and plate cultivation on Conradi-Drigalsky's medium were also used. The results obtained are recorded in tabulated form, and comparisons are made with the same tests applied to *Bacillus typhosus* and *Bacillus coli communis*.

FERMENTATION TESTS.

	Iso-dulcitol	Glucose	Saccharose	Lactose	Raffinose	Glycerine	Mannite	Salicin
<i>Bacillus enteritidis</i> (Gaertner)	+	+	-	-	-	At first no change; later + permanently	+	-
<i>Bacillus coli communis</i>	+	+	-	+	-	+	+	-
<i>Bacillus typhosus</i> ...	-	+	-	-	-	+	+	-
<i>Bacillus paratyphosus</i> (A)	+	+	-	-	-	At first no change; later + and becoming decolorized	+	±
<i>Bacillus paratyphosus</i> (B)	±	+	-	-	-	At first no change; later + and becoming decolorized	+	-

+ acid. - no change.

Dr. Thursfield very kindly carried out animal experiments with the growth obtained from the mesenteric gland. A guinea-pig was fed on emulsion of the gland culture mixed with its food, and died four days later. Post-mortem examination revealed no particular changes beyond

small hæmorrhagic streaks in the omentum. Cultures taken from the spleen and peritoneal fluid of the guinea-pig proved sterile. The heart's blood, however, yielded a pure growth of a motile Gram negative bacillus. This was put through the series of subculture tests and gave identical reactions to those yielded by the original cultures from the heart's blood, spleen and mesenteric gland of the patient. The characteristic changes in litmus milk were well marked.

A culture of the original was submitted to Dr. Klein, who kindly examined it and found it to behave like the *Bacillus enteritidis* of Gaertner. We are also indebted to Dr. Klein for his courtesy in supplying the blood-serum of a rabbit which had been rendered immune to Gaertner's bacillus.

A number of agglutination tests were applied to the three original cultures and to the culture from the guinea-pig with the rabbit's serum, and comparison was made with the behaviour of *Bacillus typhosus*, *Bacillus coli communis* and *Bacillus enteritidis* of Gaertner under similar conditions. The bacillus was also tested with a typhoid patient's serum, J. G. F.'s serum and the serum of a chance patient in one of the wards.

(1) Agglutination reactions of rabbit's serum with:—

(a) *Bacillus Obtained from Original Blood Culture*.—Dilution 1 in 50, definite agglutination in twenty minutes; nearly complete in one hour. Dilution 1 in 100, slight agglutination in twenty minutes; more marked but incomplete in one hour.

(b) *Bacillus from Original Spleen Culture*.—Dilution 1 in 50, slight agglutination in ten minutes; well marked in forty minutes. Dilution 1 in 100, feeble agglutination in ten minutes; partial incomplete agglutination in forty minutes.

(c) *Bacillus from Original Mesenteric Gland Culture*.—Dilution 1 in 50, marked agglutination at once; complete in thirty minutes. Dilution 1 in 100, slight agglutination at once; partially complete in thirty minutes.

(d) *Bacillus from Heart's Blood of Guinea-pig*.—Dilution 1 in 50, marked agglutination in twenty minutes; complete in one hour. Dilution 1 in 100, slight agglutination in twenty minutes; incomplete in one hour.

(e) *Bacillus enteritidis (Gaertner)*.—Dilution 1 in 50, marked agglutination in thirty minutes.

(f) *Bacillus typhosus*.—Dilution 1 in 50, no agglutination in thirty minutes; slight in one hour. Dilution 1 in 100, traces of agglutination in one hour.

(g) *Bacillus coli communis*.—Dilution 1 in 50, no agglutination in thirty minutes.

(2) Agglutination reactions of convalescent typhoid patient's serum with:—

(a) *Bacillus typhosus*.—Dilution 1 in 100, agglutination began at once and was well marked in fifteen minutes.

(b) *Bacillus from Original Blood Culture*.—Dilution 1 in 50, very feeble agglutination in over one hour.

(c) *Bacillus from Original Spleen Culture*.—Dilution 1 in 50, feeble agglutination in one hour.

(d) *Bacillus from Original Gland Culture*.—Dilution 1 in 50, marked agglutination in one hour.

(e) *Bacillus from Heart's Blood of Guinea-pig*.—Dilution 1 in 50, feeble agglutination in one hour.

(f) *Bacillus enteritidis* (Gaertner) and *Bacillus coli communis*.—Dilutions 1 in 50, no agglutinations in one hour.

(3) Control tests with three different sera (J.G.F.'s and two chance patients') yielded negative results in the case of each organism with dilutions of 1 in 50.

FURTHER AGGLUTINATION TESTS WERE APPLIED WITH SERA OF
HIGH DILUTIONS.

	<i>Bacillus enteritidis</i> (from C.B.)	<i>Bacillus enteritidis</i> (Laboratory stock)	<i>Bacillus typhosus</i>	<i>Bacillus paratyphosus</i> (A)
Gaertner serum (differing from one previously used)				
Dilution 1 in 100	Definite agglutination	Definite agglutination	No agglutination	No agglutination
„ 1 in 1,000	Slight agglutination	Slight agglutination	No agglutination	No agglutination
„ 1 in 10,000	Very slight agglutination	Very slight agglutination	No agglutination	No agglutination
Typhoid serum (differing from one previously used)				
Dilution 1 in 100	No agglutination	No agglutination	Marked agglutination	No agglutination
„ 1 in 1,000	No agglutination	No agglutination	Definite agglutination	No agglutination
„ 1 in 10,000	No agglutination	No agglutination	Slight agglutination	No agglutination

As *Bacillus paratyphosus* (B) underwent rapid spontaneous agglutination in dilutions with Gaertner and typhoid sera, and also with normal salt solution, the tests applied to it were obviously valueless, though such a spontaneous agglutination seems to carry with it a differentiating property of the organism.

Staining for flagella showed that the organism isolated possessed numerous wavy and very long fine flagella, resembling those of *Bacillus enteritidis*. The results obtained in subculture with the organism from the patient C. B.'s blood, spleen and gland, and from the inoculated guinea-pig's blood, accurately agree with the behaviour of *Bacillus enteritidis* in subculture. The positive agglutination to *Bacillus enteritidis* given by the patient's serum during life, taken together with the reactions of the organism obtained post mortem, also afford sufficient proof that the case was one of acute enteritis due to the *Bacillus enteritidis* of Gaertner. That the serum of a convalescent typhoid patient should produce agglutination of the organism does not invalidate its claim to specificity, for cases of typhoid fever are known to be associated with the presence of *Bacillus enteritidis*.

Further it may be remarked that as with *Bacillus coli communis* so with Gaertner, varying strains of the same organism are known to exist. This variation naturally complicates matters and adds to the difficulty of classification according to type. It may account for the apparently uncertain behaviour of the typhoid patient's serum with the bacilli obtained from the heart's blood, spleen and gland of C. B., from the heart's blood of the inoculated guinea-pig, and the laboratory stock culture of Gaertner. The latter yielded no reaction, the bacilli from C. B.'s blood and spleen, and guinea-pig's blood showed feeble agglutination, but the bacillus from the mesenteric gland gave a marked agglutination. These conflicting results are difficult to explain, and one is tempted to suggest that though the organisms obtained from the sites examined evidently belong to the same type, yet there may be a variation in strain and agglutinability according to the particular organ from which they have been derived; further it is suggested that in an infection produced by a specific organism that organism may be modified under the influence of a different environment, and as a result show variation from the original strain.

Lymphangioma of Face.

By J. PAUL ROUGHTON.

M., AGED 11. The whole of the right side of the face, with the exception of the region below and to the right of the mouth, is occupied by a swelling of a doughy consistency, the upper eyelid especially being much swollen. The swelling crosses the middle line of the forehead and upper lip. There are many cords and knots distributed throughout the swelling, especially on the forehead, over the parotid and in the cheek, and there is a distinct cord running immediately behind the facial artery over the ramus of the jaw. There



Lymphangioma of Face.

is no pulsation. The swelling cannot be diminished or displaced by pressure. There is no loss of sensation or of movement, except that the latter is very much impaired by the infiltration of the tissues, and the muscles readily react to faradism. There is no leucocytosis. There is an enlarged gland under the sterno-mastoid. Eight years ago the mother noticed that the right eye appeared smaller than the left,

and shortly afterwards the outer canthus began to swell, and from thence the swelling has gradually spread. The family history is good. The boy was at school till last December, when he left on account of pain in the upper eyelid, which lasted about a fortnight, and this is the only occasion on which he has had any pain.

DISCUSSION.

Mr. ROUGHTON, in answer to a question by the President, said that the patient had no other deformity. Two years ago a case resembling the present one was shown at the Clinical Society by Dr. Sutherland, and there was a discussion as to whether it was one of Recklinghausen's disease or of rickets. He would be interested to hear what had been the subsequent history of that case. In the present case the morbid condition was increasing, but very slowly. The patient had twice had attacks of pain, but it was chiefly inflammatory pain.

Mr. GODLEE asked whether the boy had moles in other parts of the body. He thought that the swelling felt like a plexiform neuroma of the supra-orbital nerve. Last year he had under his care an obvious case of Recklinghausen's disease, and the patient had been in hospital with an encapsuled neuroma of one of the nerves. The neuroma was easily removed and the patient came back with a similar mass in the calf of his leg. There was no difficulty in removing a piece as large as a hand from that situation. The patient was now well, and Mr. Godlee recommended operation in the present case.

Dr. PARKES WEBER asked how Mr. Roughton explained the cords distributed throughout the swelling, and expressed his agreement with Mr. Godlee's diagnosis. The swelling felt like a bag of worms, and he regarded it as a Ranken-neuroma (plexiform neuroma), analogous to neuromatous hypertrophy of half of the tongue such as had been described by Mr. Shattock. He asked whether there was any enlargement of bone.

Mr. W. G. SPENCER said that if Mr. Godlee's suggestion were correct it would be reasonable to explore, because in the case described by Mr. Shattock before the Pathological Society (the specimen from which was now in the College of Surgeons Museum) the nerves were practically encapsuled, so that they admitted of being shelled out. At all events a small incision might be made and the operation proceeded with if such an encapsuled condition were found. Although in the case to which he had referred infiltration occurred, the tumour was sharply outlined in the neck and its margins were well defined. Its extension was by means of displacement rather than by infiltration.

Dr. SUTHERLAND said the case which he showed two years ago was similar to this; the trouble was localized to the same region, and had the same feel. The tumour was a neuro-fibroma, although some members had raised the question whether the bone was involved. Skiagrams did not reveal any change in the skull. In the present case he failed to find any distortion of the bones of the nose. That the lesion should so frequently have this distribution was curious. Dr. Sutherland asked whether there was pigmentation

in any other part of the body. In Mr. Godlee's case there was very well marked pigmentation ; and over the trunk there were large splashes of brownish yellow pigment. In the absence of confirmatory signs he was not prepared to make a diagnosis of Recklinghausen's disease.

Mr. ROUGHTON, in reply, said there was no bony change, nor was there any pigmentation in other parts of the body. He would have a skiagram taken and would again report on the case.

Tumour of Mediastinum (? Hydatid Cyst).

By HERBERT FRENCH, M.D.

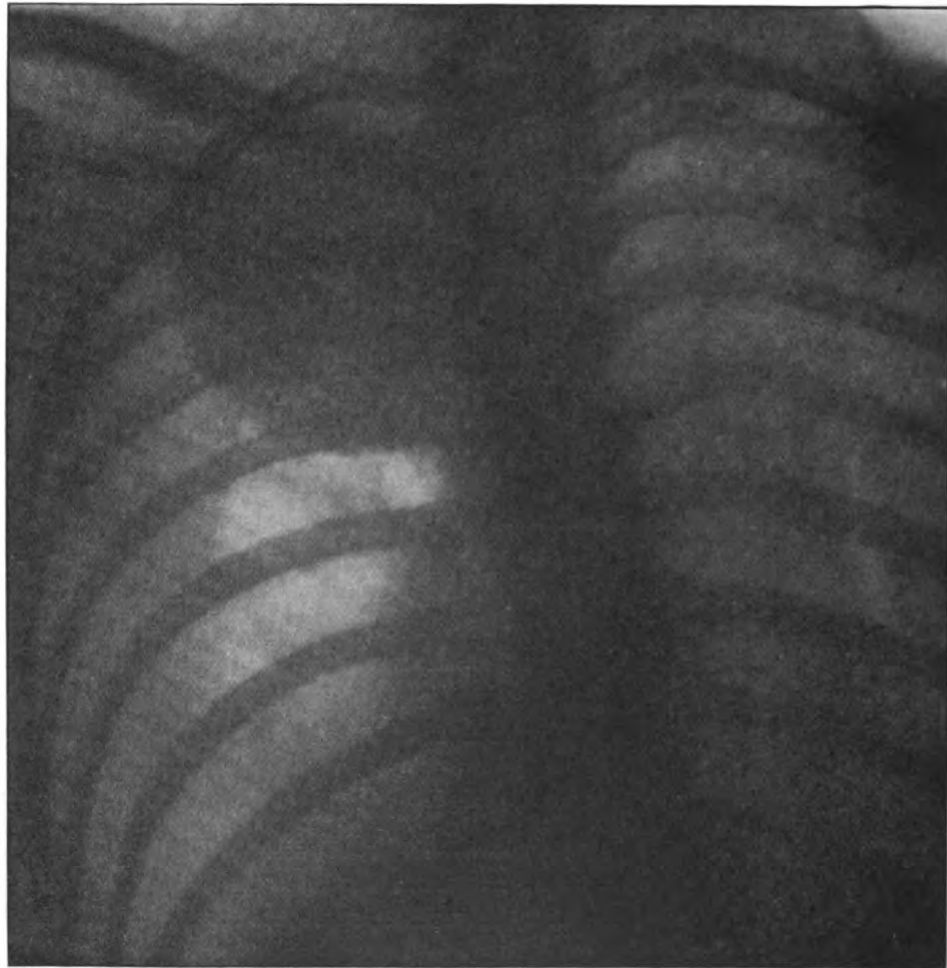
THE patient is a robust woman, aged 42. She looks perfectly well, and her only complaint is that she cannot see properly with the left eye. For this she came to see Dr. Eason at Guy's Hospital. The cause of the defective vision is, in part at least, complete paralysis of the left cervical sympathetic nerve. This dates back for over two years. There is slight but decided ptosis of the left upper eyelid ; the left pupil is continuously small ; the patient cannot blush upon the left side of the face, and when she perspires the right side of the face sweats but the left does not.

Further examination shows distinct fulness of the left external jugular vein, and the veins over the upper part of the left side of the chest in front are distinctly fuller than those over the corresponding part of the right side. Examination of the chest with the stethoscope shows complete absence of vesicular murmur and of voice sounds over the region where the upper two-thirds of the upper lobe of the left lung ought to be.

The conclusion is that, in the region of the left upper lobe, there is a mass nearly as big as a good sized orange, large enough to displace or destroy the lung there, to extend back far enough to compress the cervical sympathetic nerve, and forward enough to compress the left innominate vein.

The length of history and the general condition of the patient point to its not being malignant ; there has been no improvement under treatment by mercurials and iodides, so that gumma seems unlikely. The X-rays show a perfectly globular mass not connected with the aorta (a point less obvious in the skiagrams than it was when the screen was used in different positions of the patient) and of a size precisely corresponding with the diagnosis made.

Hydatid cyst is suggested as a possibility, chiefly on account of the perfectly globular character of the mass. The patient has no symptoms or signs of hydatid cyst elsewhere in the body. There is, however, a slight eosinophilia, the coarsely granular eosinophile corpuscles amounting to 6 per cent. of the total leucocytes in the blood.



Mediastinal Tumour. View of thorax from behind.

The latter is otherwise normal. A dermoid cyst has also been suggested; but it may be noted that Dr. Jordan's skiagram shows no sign of there being any differentiation of the contents of the mass into teeth, bones or other similar structures.

It is worthy of note that at the same time that this patient was in the ward there was another case of hydatid disease under Dr. Fawcett's care. This was in a boy who had had an operation for the cure of a hydatid cyst in the liver. He was skiagraphed also, and in the thorax there was a spherical mass very similar to that in the case shown, and this was, almost beyond doubt, a hydatid cyst within the lung.

DISCUSSION.

Dr. EASON remarked that the defective vision was not due to an inability to accommodate; and in answer to the President he stated that the condition had been present for two years. There was occasionally some pain, but not much distress. There was nothing to show how the patient could have acquired a hydatid infection, as she had never been out of England. The voice was in no way affected.

Dr. THEODORE WILLIAMS asked what there was against considering the condition to be lymphoma. He had not heard any argument against it. He did not at the moment remember having seen a hydatid tumour at the apex of the lung. The interesting feature of the case was the state of the two pupils. The patient told him objects seen with the left eye appeared only half the size of the same objects as seen with the right, showing that there was pressure on the sympathetic. He thought the case should be watched.

Dr. CYRIL OGLE said that two months ago he saw a circular tumour in the lateral part of the right chest. It did not invade the back, but pushed down the liver and displaced the heart. It proved to be a large dermoid cyst or teratoma, weighing 10 lb. The case was the second of the kind which he had seen, and there were unusual pressure symptoms. There was not much displacement of the heart, but there was considerable distension of veins. On section the tumour was seen to contain skin and other embryonic materials, was well defined, partly cystic, and there had been recent hæmorrhage into it. The man eventually died of œdema and of difficulty of breathing. The mass involved the anterior mediastinum, which was a more likely position for teratoma than a posterior position, such as the tumour seemed to occupy in the present case.

Old Fracture of Humerus, with Osteo-arthritis of Elbow.

By R. J. GODLEE, F.R.C.S.

M., AGED 34. Twenty-one years ago, when patient was aged 13, he injured his right elbow; he says it was dislocated, but he does not know that it was fractured. Three and a half years ago a small, painful swelling appeared near the elbow, which was treated in hospital. Soon afterwards a swelling appeared on the inner side of the back of the fore-

arm, 2 in. below the internal condyle, which increased in size during the last year till it reached that of a walnut. It proved to be a "ganglion" with a thin wall, the pedicle of which extended up towards the joint along the internal intermuscular septum. The clear, jelly-like contents were evacuated and the pedicle was cut short. The wound healed by first intention.

The skiagram shows an old fracture of the internal condyle and irregular masses of bone attached to both the upper ends of ulna and radius. The movements of the joint are almost perfect.

The case illustrates the good result which may sometimes be obtained after fracture of the lower end of the humerus. It also suggests that an injury to a joint in youth may determine the onset of osteo-arthritis later in life. There is at present, however, no creaking in the joint. No signs of osteo-arthritis have been discovered in other joints.

Old-standing Dislocation of Patella, with Osteo-arthritis of Knee.

By R. J. GODLEE, F.R.C.S.

M., AGED 50. The patient, who is a labourer, says that his right knee has been out of shape since birth. He knows of no injury in early life. It did not cause him much, if any, inconvenience until he had a blow upon it six months ago, since which time his knee has been painful. On flexing the knee the patella slips right over to the outer side of the joint. There is marked genu valgum, and the signs of osteo-arthritis are unmistakable. The patient is not the subject of locomotor ataxy, and there is no indication that he suffered from infantile paralysis.

The case illustrates the fact that dislocation of the patella need not necessarily interfere much with the utility of the knee, and suggests that an injury to a joint in early life may determine the onset of osteo-arthritis in the joint so affected.

DISCUSSION.

Mr. OPENSHAW said he had come to the same conclusion as Mr. Godlee, that osteo-arthritis, when it attacked a single joint, often selected one which had previously been damaged, either early or later in life. A friend of his had an injury to his hip when a child, which necessitated the wearing of a Thomas's

splint for eighteen months. He was afterwards lame for a time, but ultimately recovered. He went to South Africa, and there he caught dengue fever, after which his hip got painful and became stiffer, in spite of all sorts of treatment, including baths in many places and massage and plaster of Paris splints. He had now developed severe osteo-arthritis and was permanently lame. Other cases which he had met with also corroborated what Mr. Godlee had said.

Dr. SEYMOUR TAYLOR said he had known a patient for a number of years who had had osteo-arthritis of the hand, and the joint which was predisposed to the injury was that which was constantly getting rapped and injured, viz., the index finger of the left hand. After some years, a tumour formed on the proximal joint, and several surgeons and physicians gave various diagnoses, from papilloma upwards. His own opinion was that it contained fluid and that it was a ganglion. Six months afterwards it was cut by accident, and exuded jelly-like fluid, confirming his diagnosis. No medicine was of avail; it refilled three times and had now quite disappeared. He himself was the patient.

Dr. POYNTON said what had been said about osteo-arthritis attacking a joint which had been previously injured was very interesting, but it was possible experimentally to produce osteo-arthritis in one joint without any injury, by the intravenous injection of organisms. This would cause osteo-arthritis, with clear or gelatinous fluid and alteration of bones, so that infection, possibly many infections, could cause the condition without previous injury. In the present case one was in the dark as to whether injury was the actual cause or whether it was the predisposing cause of some infection. The man had an ulcer, and possibly an infection from that had got into the damaged joint. The injury probably diminished the resistance of the part, but it was necessary to go behind that and to consider whether there was not some infection superadded.

Dr. GARROD said it was certainly true that injury predisposed to osteo-arthritis, but that was also true of every form of joint disease. It was most strikingly true of gout, which often was first manifested in a joint which had been the seat of injury years previously. It was true also of infective arthritis. He did not suppose injury was the cause of the joint lesions, but rather that it rendered the joint a *locus minoris resistentiæ* and vulnerable for any infection which might supervene.

Mr. GODLEE, in reply, remarked that this discussion raised the question whether patients already suffering from osteo-arthritis should be warned that injury to a diseased joint was likely to aggravate the condition.

Ruptured Aortic Valve.

By SEYMOUR TAYLOR, M.D.

M., AGED 34, who has worked with lead for nearly two years, complains of tightness across the chest, a choking sensation on exertion, and a buzzing noise in the chest, which he hears best when lying down.

These symptoms supervened suddenly after the strain of lifting a heavy weight. He denies having had syphilis or acute rheumatism, but has twice suffered from lead colic. He has a typical blue line at the edge of the gums.

On palpation over the cardiac region a diastolic thrill is felt, most intense over the second and third spaces on each side. On auscultation a loud murmur is heard, loudest over the aortic area, diastolic in period and musical in tone. The musical note corresponds to about B below the staff. This point is of some interest as a similar observation was made by Dr. Seymour Taylor in a previous case shown before the Clinical Society.¹ The murmur is heard all over the chest and even over the upper thirds of the humeri. The condition of the valve is probably one of perforation of one cusp rather than of detachment or true rupture. This diagnosis is made on the following grounds, viz. :—

(1) The sudden onset of urgent symptoms after a strain, pointing to valve injury.

(2) The musical diastolic murmur.

(3) A marked diastolic thrill.

If a cusp were torn from its attachments one would expect to hear harsh noises and also to feel a thrill, not only during diastole, but also during systole.

DISCUSSION.

Sir JOHN BROADBENT asked whether there had been an autopsy on any of the other cases mentioned by Dr. Seymour Taylor. In the only case of ruptured aortic valve of which he had himself seen the autopsy severe symptoms of breakdown came on very rapidly. Right heart failure followed, of which the man died a month later. When such a sudden lesion occurred the ventricle had very little chance of undergoing hypertrophy and would need to accommodate itself very quickly to the sudden change of pressure. He asked whether Dr. Seymour Taylor had any knowledge of the condition of the man's heart before the time at which the accident was said to have happened. There was recently a case under the care of Dr. Sidney Phillips which Sir John Broadbent had thought was one of ruptured valve. The patient said that he had suddenly been taken ill after violent exertion. There was a musical murmur, similar to that heard in the present case, and a well-marked collapsing pulse, failure of the left ventricle, secondary failure of the right heart, death ensuing in a month. The diagnosis lay between rupture and recent endocarditis with a tag of fibrin on the valve. The lesion proved to be an acute aortitis with dilatation of the aorta. The aortic valves were not damaged by

¹ *Trans. Clin. Soc. Lond.*, 1903, xxxvi., p. 243

endocardial lesions. In a certain number of cases, in patients who said that they had been doing heavy work and had suddenly experienced pain on exertion, it was possible that there might have been an antecedent aortic lesion, of which the man had not been conscious until the occurrence of the severe strain, upon which followed sudden anæmia and deficiency of blood to the peripheral circulation. In one case the patient complained of sciatica and was found to have a serious aortic lesion, of which he had not been aware as it was compensated. Another man with such a lesion was the subject of tabes, and he died of infective endocarditis with a large fungating vegetation on the aortic valve. When such patients complained of sudden pain he thought that their hearts had been subjected to acute dilatation, which proved just too much for the ventricle. It would be very important in the present case to obtain evidence as to whether there was any cardiac lesion before the strain was incurred.

Dr. F. J. POYNTON said that such cases had become of great interest recently owing to the Workmen's Compensation Act. He had been drawn into a very important case of ruptured aortic valve, which came into court and was submitted to arbitration. Among the questions which were asked was: "Need there be severe pain at the time of the rupture?" Although there was pain as a rule, he thought that one might say that it was possible for a patient to rupture the aortic valve without feeling anything beyond discomfort. In the case referred to pain had been wholly absent and the patient had walked some distance after the rupture occurred. This Dr. Poynton attributed to the fact that the ruptured valve was not sound, but was the seat of a small aneurysm. The fact of the rupture was confirmed by autopsy. More recently another case had come under his observation in which rupture of a valve caused practically no pain.

Dr. THEODORE WILLIAMS said he had seen several cases of similar aortic murmurs, and in the one which he remembered best a post-mortem examination had shown that two of the aortic cusps were degenerated but were not perforated. One cusp was turned backwards on both sides, and seemed to have been reorganised and to have acted as a valve below the level of the others. The valve curtain hung like a tongue in the blood-stream, and this was doubtless the cause of the musical murmur. There must have been considerable regurgitation, and the sound was audible over the whole of the chest. The man worked in Woolwich Dockyard and had lifted a heavy mass of iron, and then fell down in a faint. He was seen by a medical man, who sent him to the Brompton Hospital, where Dr. Williams saw him. He could substantiate what Sir John Broadbent had said, that in such cases life was prolonged only for a short time.

Dr. PARKES WEBER said it had been questioned whether perforation of an aortic valve ever occurred apart from malignant endocarditis; but he had once seen perforation of an aortic curtain which was not due to that disease. It was connected with degenerative change of the valve. He thought there was no recorded case in which the valve was perforated merely as the result of accident.

Dr. SEYMOUR TAYLOR, in reply, said that all the speakers on his case had had the advantage of him, in that they had all seen post-mortem examinations of their cases. Sir John Broadbent's suggestion was a good one, but if there were extensive aortitis there would be a murmur at both periods of the cycle, whereas here, there being only one murmur, a perforation seemed more probable. He would look up the record of Dr. Theodore Williams's cases. If there were a tongue which was torn off there should be a double murmur and a double thrill. The fact that the thrill was only diastolic was also in favour of perforation.

**Caseating Pulmonary Tuberculosis treated by Tuberculin (T.R.)
and fresh Horse Serum, both administered by the Mouth.**

By ARTHUR LATHAM, M.D.

THE patient, a man, aged 22, was seized on June 3, 1907, with acute pneumonic tuberculosis of the left lower lobe. He had continuous high fever although he was kept in bed for the greater part (three months) of the time till the beginning of October, when he sought advice at the Brompton Hospital for Consumption. He was admitted to St. George's Hospital on October 8 and kept in bed for one month without any reduction of fever. At this time the patient was losing weight and there was evidence that the disease was extending and that there was commencing infiltration in the apex of the right upper lobe and in the apex of the left upper lobe. On November 6, 10 c.c. of horse serum with $\frac{1}{1000}$ mg. tuberculin were administered by the mouth. The temperature, as may be seen from the accompanying chart, then dropped to nearly the normal level for three days. On November 9 the temperature rose again to 101° F. A further dose of serum and the tuberculin was given on November 11. On November 12 the temperature was subnormal. On November 13 the temperature again rose. On November 20 and 21 serum and tuberculin were again administered with immediate effect. The temperature remained normal, or nearly normal, until December 12, when the patient was allowed to get up. This led to immediate auto-inoculation with an unknown dose of the patient's own tuberculin and consequent fever. Further administration of serum and tuberculin again reduced the temperature. On January 6 the temperature rose to 102° F., partly in consequence of an influenzal sore throat and partly in consequence of the administration of three doses of 10 c.c. serum and $\frac{1}{1500}$ tuberculin at intervals of eight hours, which led to a summation of

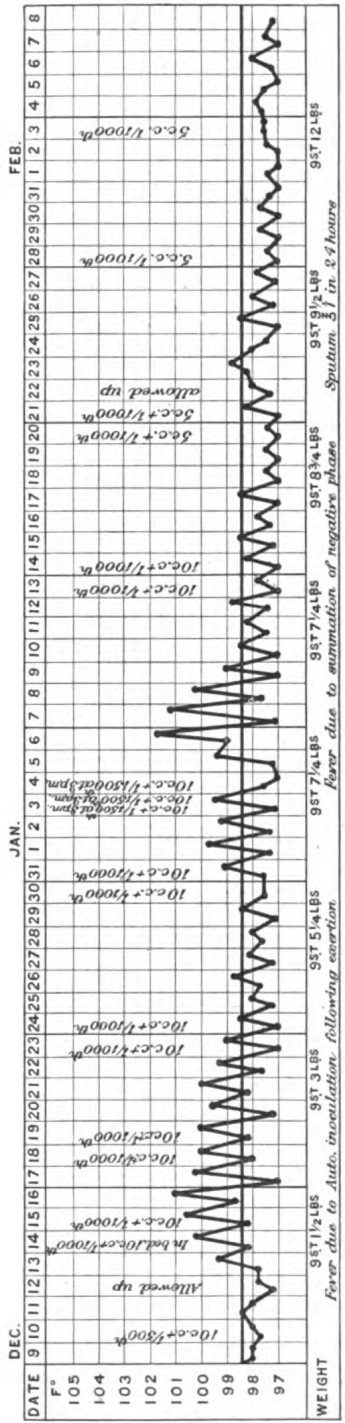
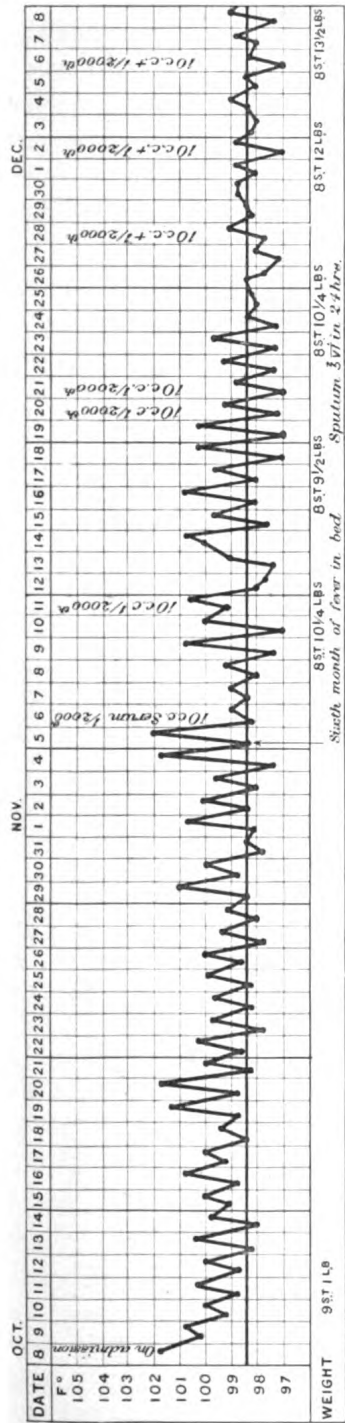


Chart showing the effect of Tuberculin (with Horse Serum) in Dr. Latham's case of Caseating Tuberculosis.

negative phase and a marked drop in the opsonic content of the blood. This proved a temporary affair. From January 10 to the present time (February 14) the temperature had been normal. The patient was now up and taking an hour's exercise a day. The physical signs now present were those of a dry contracting cavity at the left base. The sputum, which still contained tubercle bacilli, had diminished from 6 oz. to 2 dr. or 3 dr. in the twenty-four hours. The weight had increased 17 lb. A daily observation of the opsonic index had been kindly undertaken by Dr. H. D. Spitta and the curve obtained corroborated the clinical results.

Remarks.—Those who see much of pulmonary tuberculosis know how long is the arm of coincidence in this disease. It is not necessary for me to say that I do not bring this case before the Section as a conclusive example of the value of a new method. I have brought it forward that Fellows may have an opportunity of seeing it in its present stage and again at a later period. I have given tuberculin and other vaccine by the mouth—some with serum and some with normal saline solution—in twenty-five cases and I am convinced that this method of administration is effective. As to the part played by the horse serum I am not prepared to speak with any definiteness. The administration of vaccine in many cases is not, unfortunately, attended with good clinical results. It is clear that we can often increase the opsonic content of the blood by the administration of vaccines, and yet in many cases in spite of this the disease continues to extend. The opsonic content of the blood, whether it be the natural content or brought about by the administration of vaccines, does not therefore give as complete a picture of what is taking place in the blood as the result of bacterial infection. Vaccines may increase the opsonic content of the blood and yet bring about no response, or an insufficient response, on the part of the patient's own phagocytes. Again, although a vaccine like tuberculin undoubtedly has a direct effect on the response made by the body to auto-inoculation with tuberculin by remedying, to a greater or lesser extent, a deficient capacity to produce specific opsonies, yet it probably has no direct effect on any other deficiency in the patient's own serum, whether this be inherent or whether it be produced by poisonous bodies resulting from the action of tubercle bacilli or tuberculin upon the tissues. From an extensive clinical experience of various sera I have come to the conclusion that the serum itself plays some part in the clinical results obtained in addition to the part played by the specific bodies which some of these sera contain. Whether horse serum is able to supply the patient with some substance in which his own serum is deficient, or whether it stimulates the produc-

tion of some such substance, or whether it has any action, direct or indirect, on the phagocytic cells I cannot discuss to-night. I intend to bring this question of the administration of the vaccines by the mouth together with (1) horse serum, (2) normal saline solution, before the Medical Section at the end of March. I shall then deal with the results obtained in several cases of staphylococcic and streptococcic infection, pulmonary tuberculosis, tuberculous peritonitis and "surgical" tuberculosis. These cases are being treated by me at St. George's Hospital and at the Brompton Hospital for Consumption in conjunction with Dr. H. D. Spitta and Dr. A. C. Inman.

DISCUSSION.

Dr. PARKES WEBER said that Dr. Latham's remarks had some bearing upon the question of using meat from tuberculous cattle for the feeding of consumptive patients. That was one of the possible future advances in the therapeutics of tuberculosis.

Dr. THEODORE WILLIAMS said that Dr. Latham had stated his case very moderately. There were, however, other explanations possible for the improvement of the symptoms. We all knew cases in which a man had active mischief going on in his lungs and a cavity formed, with large expectoration and reduction of fever and other symptoms, and the case went on as a dry cavity case. One often found that the cases which began with fever and acute symptoms subsequently became chronic cases with a low temperature and quiet pulse, like chronic abscesses in various parts of the body. This was a natural occurrence and did not require the presence of tuberculin to produce it. He understood Dr. Latham to say that when the patient was allowed up and the temperature again rose, there was auto-inoculation; but he did not see that such was proved, though it might be true. In a recent excellent paper at the Medical Society members were introduced to auto-inoculation quite early in cases of phthisis, but he confessed that if the opsonic index had not been invented he should have regarded the symptoms as those of ordinary phthisis. Dr. Latham's method of giving tuberculin by the mouth was good, as it saved the trouble of repeated hypodermic injection. He asked whether Dr. Latham examined the expectoration for lung tissue; that should be observed as thoroughly as the opsonic index and the number of bacilli discoverable, for the important point to ascertain was, what effect the tuberculin was exercising on the lung tissue, healthy and diseased. He hoped Dr. Latham's efforts would be crowned with success.

Dr. LATHAM, in reply, said he agreed with Dr. Parkes Weber that there was a possibility that people might be immunised by giving them cooked tuberculous meat. Within the last month or two, at the Pasteur Institute, they had been able to immunise animals against tuberculosis by feeding them

on dead bacilli under certain conditions. That fact had confirmed him in the belief that the tuberculin given by the mouth was a possible therapeutic measure. In answer to Dr. Theodore Williams, he said that his remarks were directed not to auto-infection, but to what was now called auto-inoculation. Nothing did consumptives so much harm as over-exertion and fatigue, and it had been conclusively shown—especially by Dr. Inman's work at the Brompton Hospital—that that was chiefly due to an excessive absorption of tuberculin which followed undue exertion, so much so that in early cases of tuberculosis one could diagnose the presence of the disease by the effect on the opsonic curve of auto-inoculation brought about by exertion. In caseous tuberculosis, if the patient were allowed to get up after the temperature had come down to the normal, the temperature frequently rose again. That was largely due to the fact that under the influence of exertion there was a freer circulation through the lungs and a freer absorption of tuberculin.

Spurious (?) Acromegaly.

By F. PARKES WEBER, M.D.

MRS. S., aged 46. This case is shown because of its remarkable resemblance at first sight to acromegaly. The patient is a married woman, rather corpulent, and very anæmic. Her face and head, with the large lower jaw, prominent chin, and big, broad, fleshy nose, could be used as a model for an illustration of acromegaly. She has very broad, fleshy hands and thick fingers and very broad, thick, fleshy feet, but she has no ocular symptoms of acromegaly; and her occasional headaches and shortness of breath seem to be connected with her anæmia, which in its turn may be accounted for by frequent hæmorrhoidal bleeding, from which she has suffered during the last six or seven years. There is no amenorrhœa, as there is in many genuine cases of acromegaly. Moreover, there is no evidence of any progressive change having occurred in the shape or size of the hands, feet, face, skull, or other bones of the body since she ceased growing at the ordinary age. An old photograph (the only one obtainable for comparison), which was taken three or four years ago, shows her face looking just as it does now. She has six children, all healthy, and at least one of the daughters somewhat resembles the patient in the shape of the chin. The case has probably been more than once accepted as one of genuine acromegaly.

(Dr. Archibald D. Reid, who kindly examined the patient's head with Röntgen rays, found that there were no bony alterations in the region of

the sella turcica, such as he had been able to demonstrate by the aid of Röntgen photographs in cases of pituitary tumour.)

Lateral Curvature rapidly developing in a Boy.

By W. G. SPENCER, M.S.

M., AGED 3, an inmate of a Poor-law school, was all at once noticed to have a marked lateral curvature, the only previous observation being that he seemed a little anæmic. He has a marked left thoracic and lumbar scoliosis and walks with lordosis; both of these curvatures disappear when he is suspended by the arms. The muscles of the left side of the spine appear unduly weak, the abdomen is irregularly protuberant, but there is no definite hernia, either inguinal or ventral. Hæmoglobin, 74 per cent. Beyond this, examination has discovered nothing distinctly abnormal; the reflexes are normal, the muscles of the spine react to faradism and galvanism, no muscles are absent.

Excision of the Body of the Scapula.

By R. P. ROWLANDS, M.S.

M., AGED 35, from whom the whole of the body of the left scapula was excised for enchondroma fifteen months ago. It was possible and deemed advisable to save the coracoid process, with its important muscles and ligaments, the glenoid cavity with the capsular ligament of the shoulder-joint, and the acromion process, with the attachments of the deltoid and trapezius to it. The origin of the long head of the triceps was preserved.

The patient shows that both the functions and the deformity following this procedure are much less than after complete excision of the shoulder-blade. The man has been able to do his work as a painter's labourer at Guy's Hospital from two months after the operation. Extreme abduction is the only movement that is imperfect, but the hand can be easily made to touch the back of the head. In the case of complete excision rotation is perfect, external rotation being probably carried out by the long head of the triceps; rotation of the shoulder-joint is limited to one-half the natural extent and the abduction to 45°.

Radiograms are exhibited to show the comparative effects of the operation adopted in this patient and of complete excision of the scapula for extensive sarcoma by Mr. Dunn, who has kindly allowed me to make use of his case. Photographs are also exhibited which show the differences of function and degree of deformity in the two cases.

A posterior T-shaped incision was used, and through this the three groups of large vessels were tied early in the operation to minimise hæmorrhage.

It is claimed that preservation of the processes and glenoid cavity is both practicable and advisable in preference to complete excision of the scapula for all innocent and some malignant growths, as well as for some inflammatory conditions which do not affect the shoulder-joint.

Case of Multiple Dislocations, including Congenital Dislocation of both Hips, in a Child, aged two weeks, incontestably the Result of Malposition in Utero.

By T. H. OPENSHAW, C.M.G., M.S.

M. G., AGED two weeks, was brought to me as an out-patient at the London Hospital on February 7, 1908, presenting dislocation of both shoulders, both elbows, both hips, and both knees, and extravagant double equino-cavo-varus. The child otherwise is well formed; the cranium presents no deformity. There is a large umbilical hernia and a history of snuffles. The mother has five other children and has had three miscarriages. The first was a miscarriage at seven months, the second is now aged 8, the third was born dead at seven months, the fourth is now aged 5, and the fifth is aged 2.

The pregnancy was normal, except that the mother had a fright when four months pregnant. The position in which the child lay *in utero* can be definitely reconstructed. The limbs in their abnormal position fitted closely to the body; the hips fully flexed, the knees hyperextended, and the feet twisted into the position of equino-varus. The arms are flexed at the elbow-joints and rotated in at the shoulders, so that the hands are situated in the armpits in a position of acute flexion at the wrists.

The right leg: the head and neck of the right femur are rotated outwards upon the shaft through an angle of 30° . The head is dis-

located, and lies outside and in front of the anterior superior spine. The thigh was acutely flexed on the abdomen, the inner surface of the femur rested *in utero* upon the abdomen. The condyles are visible in the popliteal space, the knee being retroflexed to an angle of 100° . The knee can only be flexed, even with force, to an angle of 160° , and immediately drops back to an angle of retroflexion of 110° . There is extravagant congenital equino-varus, the sole of the foot looking upwards. The scaphoid is the lowest bone of the tarsus.

The left leg presents a similar condition, except that the knee is hyperextended to an angle of 100° , and can only be flexed to an angle of 170° . The left foot presents the same condition as the right; the scaphoid is the lowest bone.

There is a large funnel-shaped umbilical hernia, which bulges between the knees when the legs are in the position in which they were *in utero*.

The right arm: there was a subcoracoid dislocation of the shoulder. The elbow: both bones were dislocated backwards and outwards. There is marked pronation of the forearm. The fingers are well formed, but excessively hyperflexed at the metacarpal phalangeal joints. The transverse metatarsal ligaments are extravagantly stretched, so that the heads of the metatarsals can be separated and the hand stretched out to a width equal to double the length of the palm.

The left arm presents a similar condition.

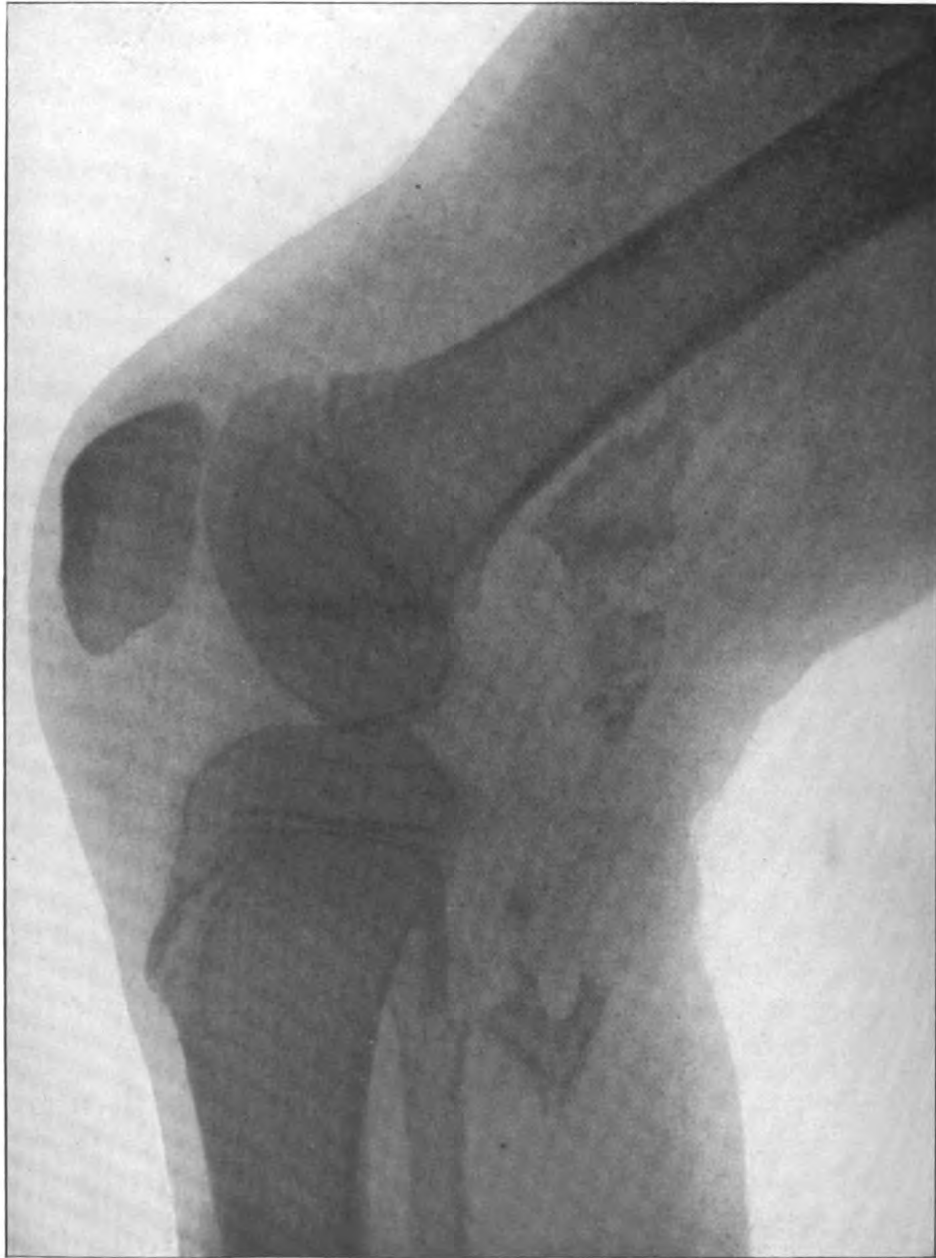
The muscular system of the child is normal. There is no paralysis. The child, except for the dislocations, is well developed. There is no lateral curvature.

This is incontestably a case of congenital dislocation of hips, knees, shoulders, and elbows from intra-uterine malposition. I have seen two other cases where congenital dislocation of the hip has been associated with congenital recurvation of the knees and talipes in the same leg, and was, in my opinion, due to intra-uterine malposition and pressure.

A Case of Myositis ossificans.

By CYRIL A. R. NITCH, M.S.

EDITH W., aged 10, was seen at the Evelina Hospital for Children in February, 1908. Her father, mother and eight brothers and sisters are all alive and quite healthy. There is no history of syphilis or tubercle in



MYOSITIS OSSIFICANS.—Skiagram of right knee, showing bone in hamstrings and calf muscles. Note the long spicule attached to the back of the tibia.

the family. When aged $3\frac{1}{2}$ both tonsils were removed, and a fortnight later a hard and tender swelling appeared in the neck on the right side. This subsided in a couple of weeks, but fourteen days later a similar swelling was noticed on the left side, which, however, soon disappeared. Within a short time the mother noticed a hard mass in the right side of the neck, and a few months later similar lumps were to be felt in the left pectoral, scapular and lumbar regions.

When aged 4 the case was shown to the Society for the Study of Disease in Children by Dr. George Carpenter and Mr. Walter Edmunds.¹ Her condition was then as follows: there was a spicule of bone in the left sterno-mastoid, and the muscles of the neck on the same side were infiltrated and hard. Just below the chin there was a prominence the size of a pea due to bony infiltration of the genio-hyoid muscles. Plates of bone could also be felt in the right sterno-hyoid, right coracobrachialis, left pectoralis major and erectores spinæ. In September, 1901, Mr. Edmunds cut deeply into the back and removed some tissue for microscopical purposes. No normal muscle fibres were present their place being taken by fibro-cellular tissue.

Present condition. The disease has advanced considerably. The back and neck are now quite rigid, movements at the shoulder are very limited, full flexion of the leg is impossible, and owing to the fixation of the thorax respiration is purely diaphragmatic. Osteoid tissue in the form of plaques, bosses and spicules can now be felt in the erector spinæ, latissimus dorsi, trapezius and pectorales of both sides, the right rhomboideus major and minor, the left rhomboideus minor, the left levator anguli scapulæ, the left infrapinatus, the sterno-mastoids, the right vastus externus and the muscles in the popliteal space (*see* skiagram), while the pea-like prominence of bone in the genio-hyoid noticed by Mr. Edmunds in 1902 has now become a long spinous process. Microdactyly of both great toes is also present.

Sarcoma of Thigh.

By H. A. T. FAIRBANK, M.S.

G. S., a male, aged 4. A swelling, the size of a hen's egg, was first noticed at the site of the main tumour about two months ago. The mass has therefore been growing rapidly. The child has been able to

¹ *Rept. Soc. Study of Dis. in Child.*, 1902, ii., p. 96.

run about and there has been no pain up till five days ago, when he complained of pain over a gland below Poupart's ligament. The delay in seeking advice was the result of an attack of measles. The child is said to have "picked up" since the measles, which had pulled him down. No symptoms of disease elsewhere. The patient is the youngest of four children. The others are healthy. No history of tubercle or syphilis.

There is now a large, very hard, nodular mass growing in the deep fascia and muscles on the outer side of the thigh. The mass is not attached to the skin nor to the bone. There are large, hard glands in the groin and in the abdomen along the iliac vessels.

Clinical Section.

March 13, 1908.

Sir THOMAS BARLOW, Bt., K.C.V.O., President of the Section, in the Chair.

A Case of Hermaphroditism, in which the Uterus occupied the Sac of an Inguinal Hernia.

By THOMAS H. KELLOCK, F.R.C.S.

ALTHOUGH cases of hermaphroditism are not extremely rare, the particular complication met with in the following one must, I think, be very exceptional.

The patient, a professional man, aged 25, consulted me about a left inguinal hernia; except that he was of very short stature and had very little hair on his face, there was nothing noticeable in his appearance; his voice was strong and markedly of the masculine type; the mental faculties, if anything, above the normal. He stated that when he was quite an infant he had been the subject of a left inguinal hernia, but that he himself had never noticed its presence until quite recently, when a strain brought it down again, and since then it had constantly been making its appearance, at times causing him a good deal of pain; on one or two occasions he had had a good deal of difficulty in reducing it.

On examination the following condition was found: the penis was of fair size, but incurved; the prepuce hood-like; and there was a marked condition of hypospadias, the urethra opening at the junction of the under surface of the penis with the front of the scrotum. The right side of the scrotum was empty, and no testicle could be felt in the inguinal canal or iliac fossa. On the left side the testicle was present in the

scrotum; it was, perhaps, a little undersized and rather higher than normal; sensation in it was normal. In the left inguinal region a rather large hernia was present; part of this, which was either omentum or intestine, was easily reduced, but there still remained a hard swelling in the canal which was apparently irreducible and which, at the time of examination, was thought to be a piece of omentum adherent in the sac.

An operation was undertaken with a view to curing the hernia. When this was performed it was found that the swelling, which had been thought irreducible, had disappeared, but had left a good deal of fulness along the inguinal canal.

On exposing the spermatic cord by the usual incision a sac was very distinctly seen lying quite superficially among the other structures of the cord towards the lower part of the wound. This was separated and opened. It was found that it did not extend upwards any further, and so did not communicate with the peritoneal cavity; but it extended downwards to nearly the bottom of the scrotum and contained the testicle, which was attached to its posterior wall near the centre; the testicle was rather small, but of natural shape and consistence; leading down from it to the lower part of the sac was the spread-out epididymis, and the vas deferens led from this upwards along the posterior wall of the sac.

The greater part of this sac having been removed as in the operation for hydrocele, the cord was examined above and another sac was found adherent to the upper end of the other, but not continuous with it internally, the vas deferens lying in close contact with its posterior wall. On opening the second sac it was found to be empty and to communicate directly by a rather large opening with the peritoneal cavity; on pulling on the sac gently a mass of some size was brought out through this opening, which was found to be adherent to the inner wall of the sac and only partly covered by peritoneum. It was drawn well out and proved to be a uterus about the size of a horse-chestnut; on the upper side—that is, what would be the right side of the organ—there was a well-marked broad ligament, and, leading from the right cornu, a round ligament terminating in a blind expanded end. Lying on the back of the broad ligament and in the usual situation of the ovary was a small, oval-shaped, very white body about the size of a haricot bean, irregular on the surface. A definite fibrous band leading from the left cornu of the uterus down the posterior wall of the sac towards the left testicle, but not connected with this or with the vas deferens, was all that could be found representing the left broad ligament.

The opening into the upper sac was closed by a continuous suture, the sac freed from its connections with external structures, and reduced, with the uterus, into the abdominal cavity without much difficulty. The operation was then completed by returning the left testicle to the scrotum and closing the inguinal canal by sutures; when it had been finished it was found that a little white glairy fluid had escaped from the urethral opening.

Recovery was uneventful, and quite recently I heard from the patient that, so far, the operation had been quite successful.

DISCUSSION.

Mr. PEARCE GOULD suggested that it would add to the interest of the case if Mr. Kellock could say whether a prostate could be felt by rectal examination.

Mr. KELLOCK, in reply, said that he believed that he was right in stating that no prostate could be felt, but he could not speak with absolute certainty on this point.

A Case of Angina pectoris with Aortitis.

By F. PARKES WEBER, M.D.

THE patient, a German married woman, aged 42, was admitted at the German Hospital on the morning of January 2, 1908, and died in the afternoon of the same day. She was a fairly well nourished, pale-looking woman of medium size, and complained of great pain in the chest to the left of the sternum, just above the cardiac area. Over this area there was a good deal of rather coarse crepitation to be heard, but I could make out nothing special by examination of the heart and abdominal organs. The pulse was 95 to the minute, regular and rather weak. The radial arteries did not feel diseased. There was no dyspnoea. The face was pale and the lips slightly bluish. There was no oedema. The temperature was 99° F. The urine was of specific gravity 1017, free from albumin, sugar and tube casts, and giving no reaction for aceto-acetic acid (Gerhardt's reaction with perchloride of iron). She had not been ill long, but the history which I obtained from the patient was very incomplete. The temperature was against the idea of any acute inflammatory condition. She was treated with hypodermics of camphor in oil and with small doses of alcohol, as if for a condition of collapse. In the afternoon she was given one subcutaneous injection of liquor strychninae hydrochloratis ℥ iij. (which seemed to make no difference), and oxygen inhalation was employed. The pain, however, persisted, the pulse became weaker and the crepitation in the upper part of the left lung (back as well as front) became more marked. There was likewise a little fine crepitation over the right lung. She vomited three times in the hospital, and had vomited once before admission. She died suddenly about 5 p.m., that is, about eight hours after her arrival.

Information obtained later on from the husband threw fresh light on the illness. The completed history seems to be as follows: The patient used to enjoy good health, and never had a severe illness before the present one. She was always pale. Her father died with "dilatation of the heart" at about the age of 60. The husband gave no definite history of syphilis. The patient herself had had four children: the two younger ones only were still living; of the two first, one was born dead and the other died soon after birth. During the summer of 1907 the patient used to complain of pains in the stomach, and her fingers used sometimes to turn white and cold ("local syncope"), but otherwise she

remained in apparently good health and did her ordinary work as before. From December 22, 1907, she commenced to complain of a sensation of pressure in the stomach and pains on the left side of the front of the thorax, and began to lose strength. She obtained pills and medicine from a doctor, but the pains increased every day. The slightest exertion would induce a pain on the left side of the chest. On the night before admission the pain became unbearable. She vomited once.

This history suggested that the illness was a kind of ingravescent angina pectoris ending in a "status anginosus" and syncope, and the *necropsy* made it certain that this view of the case was the correct one.

The pathological changes were practically confined to the thoracic aorta and the orifices of the coronary arteries, the whole being evidently the result of a process of aortitis, affecting chiefly the first part of the aorta. This first portion of the thoracic aorta was much sclerosed and irregularly thickened and slightly bulged, as if aneurysmal dilatation were commencing. The orifices of both coronary arteries were much stenosed owing to the aortic change, but excepting for this stenosis at their orifices both vessels were practically free from disease. The rest of the thoracic aorta and the abdominal aorta were affected similarly to the first portion, but to a very much slighter degree. The heart, of about normal size, weighed 12 oz., and its muscular substance did not appear diseased; there was no valvular affection. Both lungs were oedematous; there was no evidence of pneumonia, tuberculosis, syphilis or infarction in these organs. There was no disease of the mediastinal lymphatic glands. The liver (weight 55 oz.) showed signs of chronic passive congestion, but not nearly sufficiently to be termed a "nutmeg liver." There was a transverse constriction, a minor form of that caused by "tight lacing." There were no biliary calculi. The kidneys (weight together 11 oz.) appeared free from disease, and the capsules stripped readily. The spleen was of about normal size and weight (weight 6 oz.) and seemed healthy. In the stomach a little submucous ecchymosis was noted. The intestines and generative organs were not diseased, except for the presence of an ovarian cyst.

Microscopical examination of a piece of thickened ascending aorta showed the pathological process to be one of aortitis, as yet unaccompanied by any marked atheromatous or calcareous degenerative changes. The intima was irregularly thickened, and in the media and adventitia there were numerous patches of cell infiltration (lymphocytes, plasma cells). These foci of cell infiltration were larger and more numerous in the adventitia, whilst in the media they formed smaller spots and streaks

around the vasa vasorum. The presence of one or two giant-cells amongst the other cells was kindly pointed out to me by Mr. S. G. Shattock, but they were not typical of tuberculosis, and an examination of sections specially stained for tubercle bacilli gave a negative result.

Remarks.—In regard to the etiology of the aortitis in this case it is impossible to arrive at any absolute conclusion, but there are certain points suggesting a syphilitic origin in spite of the absence of syphilitic changes elsewhere in the body. The character of the cell infiltration (lymphocytes, plasma cells) and its distribution about the vasa vasorum in the media is such as might be met with in syphilitic cases.¹ In syphilitic aortitis, according to Heller and others, the ascending aorta is especially affected, as it was in this case. Moreover, the age of the patient, the history regarding her two first children, and the absence of other obvious causes of arterial disease lend a certain amount of support to the syphilis theory. The clinical history of the case is characterised by the rapid increase in severity of the anginal attacks. At first these troubled the patient only occasionally on exertion, then muscular exertion of any kind would invariably induce an attack; finally, a severe attack occurred, in the absence of any obvious exertion, at night time, and next morning the patient was admitted with the fatal "status anginosus." Heberden and Huchard have pointed out that nocturnal attacks of angina pectoris are apt to be of long duration, and Huchard has laid stress on the influence of the bed position in increasing the blood-pressure and myocardial work, and thus inducing nocturnal attacks of angina pectoris. In some patients subject to angina pectoris the position of rest in bed at night time is by no means the position of maximum rest for their cardiac musculature. In regard to the much discussed question of the causation of angina pectoris this case is of some interest. Sir Clifford Allbutt maintains that the only essential cause of attacks of genuine angina pectoris is aortitis, but that coronary stenosis is frequently present as a fatal complication. Disease of the coronary arteries, so conspicuously present in many fatal cases, has, he thinks, been wrongly regarded as the real cause of the anginal attacks. On Sir Clifford Allbutt's theory, cases of recovery from true angina pectoris might be accounted for by supposing the anginal attacks to have been due to a condition of aortitis unaccompanied by any considerable stenosis of the coronary arteries. Moreover, the post-mortem discovery of coronary

¹ So extensive was the cell infiltration in the aortic adventitia around the commencement of one of the coronary arteries (which was microscopically examined) that, if due to syphilis, the process might almost be termed "syphilomatous."

stenosis in persons who during life have never suffered from angina pectoris might also be explained on the supposition that there had never been sufficient aortitis present to determine an anginal attack. This "aortitis" theory does, however, not account for the occurrence of coronary stenosis without typical angina pectoris when the stenosis is due to an aortitis more or less occluding the coronary channels at their commencement.¹ On the other hand, the occasional failure of coronary stenosis to produce angina pectoris may be explained by supposing that when the coronary stenosis is of exceedingly slow and gradual development, the patient may have time to accommodate himself to his disease and may finally die of dilatation of the heart and gradual cardiac failure without ever having had an attack of angina pectoris. On the "coronary" theory it is also possible to account for occasional cases of recovery from true angina pectoris, for the swelling (due to aortitis) at the commencements of the coronary arteries might in rare cases be supposed to subside without giving rise to permanent coronary stenosis. The present case appears to me to lend as much support to the "coronary theory" as to the "aortitis theory," but can certainly not be adduced as supporting any of the other theories of angina pectoris.

DISCUSSION.

Dr. JAMES MACKENZIE said the case was of very considerable importance, and was unique in some ways. It was manifestly a case of true angina pectoris with no increase in the blood-pressure. There was none of that condition of which a good deal was heard at present—high blood-pressure and contracted arteries—which Dr. Russell, of Edinburgh, spoke of as "hypertonus." He presumed there was no attempt to give relief in this case by amyl nitrite; it would have been interesting to see what the result of such treatment would have been. He had seen somewhat similar cases in which that line of treatment had been useless, while in others the nitrite had given relief, even when there was very low blood-pressure. His opinion, after having administered amyl nitrite to many patients suffering from angina pectoris, was that one was not justified in saying that it simply relieved temporary spasm of the arteries. The question was a complicated one which need not be discussed. It was of no use putting forward theories about the causation of angina pectoris, as there were already too many. Not long ago Dr. Weber showed before the Section an interesting case of intermittent claudication, and in that case it was evident that the muscles

¹ Compare the case of obliteration of the commencement of the right coronary artery (apparently from syphilitic aortitis and without history of attacks of angina pectoris) which I brought before the Pathological Society of London in December, 1905 (*Transactions*, 1896, xlvii., p. 16).

of the legs were able to carry on their work when they had a good supply of blood; but when the blood-supply to the part was deficient, as when exertion was made, pain resulted. In the present case there was much stenosis at the mouth of the coronary artery. When the patient was at rest, his heart muscle was able to carry on its work, but upon exertion there was pain. There was no occasion to go into the question of the aortitis. If cases of angina pectoris in people who worked hard, such as engineers, were watched, and the observations were extended over many years, it would be found that they did their work while sclerosis was proceeding in their vessels; but that there came a time when they did not feel fit for work, and then exhaustion came on, frequently terminating in an attack of pain. As the damage was not very great, treatment and rest enabled them to recover temporarily, the reason being that there was a transient impoverishment of muscle.

Dr. F. de HAVILLAND HALL said that he thought it not improbable that syphilis was the cause of the lesion when the sex of the patient was considered—angina being rare in women—her age, and the rarity of changes in the aorta in women, as well as the fact that the first child was born dead and the second died soon after birth. In support of Sir Clifford Allbutt's view that the pain in angina pectoris was due to aortitis was the fact that angina pectoris was almost confined to patients with aortic disease, as shown by the obstructive or regurgitant murmur, or by the presence of an aortic aneurysm. Mitral regurgitation was almost unknown in subjects of angina. There were cases of mitral stenosis with anginoid symptoms, *i.e.*, pseudo-angina. He thought a distinction should be drawn between true angina pectoris and the milder attacks which were specially observed in females, and were not very uncommon in association with mitral stenosis. He had hoped to hear that amyl nitrite had been tried in this instance, as he had seen cases in which, though the blood-pressure was comparatively low, that drug had afforded relief. Failing that, he would have injected atropine and morphine subcutaneously.

Sir DYCE DUCKWORTH said that he had very little doubt as to the etiology of the case or that it illustrated an effect of syphilis. The points to which Dr. de Havilland Hall had directed attention were such as all might agree to, and he thought the aortitis was syphilitic. He recognised that anginoid symptoms did occur—the so-called pseudo-angina—and that this term was required, at all events as an expression of ignorance. Grave angina was practically never seen in a woman. There was no doubt about the agony of angina being due to cardiac distension, just as when any hollow viscus was stretched there was great pain, especially when the distension was of acute onset.

Dr. GARROD said that ten years ago there was a patient in Sir William Church's wards at St. Bartholomew's Hospital who had been admitted with pneumonia and was sufficiently recovered to be sitting propped up in bed talking to his friends. He was suddenly seized with a most intense præcordial pain, which could not be relieved by any of the remedies which were tried, and in half an hour he was dead. Next day Dr. Garrod made a post-mortem examination. There was pneumococcal endocarditis, a long trailing vegetation

being attached to one of the aortic cusps—which had not caused a murmur during life—and the end of that vegetation was missing. It was found blocking the mouth of the right coronary artery, which it had embolised. As far as he could remember at that distance of time there was no disease of the aorta. The only lesion which could have accounted for the acute anginoid pain was the plug cutting off the circulation in his right coronary artery. The case, which had been recorded by Sir William Church,¹ seemed to have an interesting bearing on the present discussion.

The PRESIDENT asked whether there had been any bacteriological investigations made, especially with regard to the *Spirochæta pallida*.

Dr. PARKES WEBER, in reply, said that the *Spirochæta pallida* had been rarely found in tertiary syphilis, and he had not looked for it in the present case. He had been glad to hear that both Dr. de Havilland Hall and Sir Dyce Duckworth took the view that the aortitis was syphilitic, but he supposed one could not be sure in a case like the present one until the local presence of the syphilis microbe was demonstrated. Searching for the *Spirochæta pallida* in tertiary syphilis, however, must be as tedious and discouraging as looking for the *Bacillus tuberculosis* in lupus verrucosus, or more so. He had read of the interesting case mentioned by Dr. Garrod, but was glad to hear of it from one who had been present at the necropsy. He believed there had been one or two similar cases recorded.² It was doubtless the suddenness of the obstruction of the coronary artery in the particular case mentioned by Dr. Garrod which gave rise to the rapidly fatal symptoms, because it was not very rare at necropsies to find one of the coronary arteries obliterated without such symptoms having been produced. In such cases the process of obliteration was gradual, but in the case referred to by Dr. Garrod closure of one coronary artery was so sudden that there was not time for collateral circulation to be established through the anastomosing branches of the other coronary artery. Dr. James Mackenzie's remarks emphasised the coronary theory as furnishing the most probable explanation of the anginal pain. Dr. Weber would have tried amyl nitrite had it not been for the peculiar and misleading physical signs (local crepitation) which he found, and the diagnostic difficulty before the more complete history was obtained. If he had a similar case again, nitrite of amyl would be the first thing he would try; and he believed a good method was to direct a stream of oxygen against the nostrils and hold the broken capsule of nitrite of amyl in that stream.

¹ The case referred to was recorded by Sir William Church in the *St. Bartholomew's Hospital Reports*, 1896. xxxii., p. 7. The patient was a man, aged 40. There were two attacks of severe præcordial pain with an hour's interval between them. The arch of the aorta was somewhat dilated and the thoracic aorta was very atheromatous. The fact that the aorta was atheromatous had escaped the memory of the speaker, but there can be little doubt that the fatal attack with præcordial pain and dyspnoea was due to the embolism of the coronary artery.

² See especially L. Hektoen's case, *Med. News*, Philadelphia, 1892, lxi., p. 210; and Korczynski's case, abstracted in *Jahresb. f. d. gesamt. Med.*, xxii. Jahrg. (1887), Berlin, 1888, ii., p. 219. There are other cases of sudden death from coronary embolism recorded without mention of anginal pain.

**Purpura hæmorrhagica with Fatal Result from Cerebral
Hæmorrhage.**

By S. W. CARRUTHERS, M.D.

Mrs. I. M. B., aged 59; had been a healthy woman, with no history of serious illnesses; had one ovary removed (precise reason unknown) a good many years ago; has occasional rheumatic pains, chiefly muscular; slight nodular enlargement of interphalangeal joints present.

On December 27 she consulted me on account of slight blackish marks in various parts of the body, chiefly on the shins, thighs and forearms. These were ecchymotic in character, like faint bruises, and the shape and position of several of them suggested that they had been caused by a slight blow or squeeze. There were no diffuse ecchymoses, no petechiæ, no tenderness and no joint trouble. No cause could be discovered for the condition. Tongue clean, bowels regular, temperature normal, pulse normal in rate, beat slightly weak, tension average; arteries possibly rather "old for her age." No distinct malaise, but she said that for two or three months she had felt a little below the mark, and her ordinary duties had been an effort to her. She was ordered calcium lactate in 10 gr. doses three times a day.

On December 30 she consulted me again; new crops of subcutaneous ecchymoses had appeared, some of which were more marked than the earlier ones had been; one very dark one on the right forearm was distinctly tender. In one instance, and one only, could she give a history of violence producing an extravasation, namely, that while rubbing her left hand with the towel after washing she noticed a blue spot come suddenly, "as if one of the veins had broken." There were no hæmorrhages from the mucous membranes nor any extravasations in the mucous membrane of the mouth. There were some petechiæ on the shins; the great majority of the subcutaneous ecchymoses showed distinct foci.

On January 3, as the condition was progressive and one of the extravasations in the right forearm was sufficient to cause distinct swelling, the patient went to see Dr. T. H. Green. She took a specimen of urine to him, which was found quite free from albumin and in other respects normal. On his advice she was to rest considerably, to take the juice of a lemon daily, and to have liquor ferri perchlor. $\mathfrak{m}\mathfrak{x}\mathfrak{v}$. and

liquor arsenic. hydrochlor. \mathfrak{mij} . thrice daily. Calcium lactate was to be administered in a single dose of 20 gr. each morning.

On January 4 she remained in bed, and I arranged that she should not get up for three days. There was no change in her condition, save that some of the subcutaneous extravasations seemed to be extending slightly (possibly only by diffusion of the blood-pigment).

On January 5 I was called at 9 a.m. to find that she had had a slight epistaxis, was feeling very sick, and had "a splitting headache." Temperature and pulse were normal; she was sitting in bed holding her head between her hands, and occasionally retching. Bile-stained fluid was brought up on one occasion, but no blood. Soda-water in table-spoonful doses every ten minutes was prescribed, and a draught containing 20 gr. of potassium bromide was given. The calcium lactate had not been taken that morning on account of the sickness. Shortly after 12 she got out of bed and passed a black, rather tarry, motion. She seemed more comfortable on getting into bed, settled down as if to sleep, and was left alone for awhile. Shortly before 1 p.m. her husband entered the room, found her lying in the same position, but quite unconscious and breathing heavily. He at once came for me, and I called my partner, Dr. Grinling Bunn, to see her with me. We found her quite unconscious, pupils reacting very faintly, if at all, to light, right pupil distinctly contracted, left one rather dilated. Left arm motionless and flaccid, right arm moving restlessly over face, neck and head; both legs moving frequently—the right jerkily and spasmodically, the left in a more natural way. There was no paralysis of the face and no strabismus. Respirations, 27; pulse, 60, full; tension, 14, by Potain's sphygmomanometer. She retched a little and again brought up a little bile-stained fluid without blood. An ice-bag was applied to the right side of the head. During the next two hours she lay with little change of condition. A faint diffuse ecchymosis, without any focal centre, was noticed in the circum-oral area, and this gradually increased during the remainder of life. It was the only cutaneous or subcutaneous hæmorrhage in the head and neck. Pulse and respiration remained the same, and quite regular, save for an occasional deep sighing inspiration. The unconsciousness deepened, however, as indicated by the gradual cessation of movement of the right arm and the decrease in the movements of the legs. Before the movements decreased, those in the right leg had become more spasmodic in character. Both legs were slightly drawn up on tickling the soles. The left arm remained flaccid till about 3.30 p.m., when it showed signs of rigidity, which increased thereafter. About

the same time the right pupil began to dilate, though at 4 o'clock it was still rather smaller than the left. About 4 p.m. Sir Lauder Brunton saw her and confirmed the details of the case; he found both arms somewhat rigid, but the left distinctly more so than the right. There had been no retching for over a couple of hours, but it showed a slight tendency to begin again. About 4.30 p.m. I left her to order at the chemist's the enemata of calcium chloride and trinitrin suggested by Sir Lauder Brunton. At 4.55 p.m. I was summoned back in the greatest haste to find her dead. A relative gave a clear account of what had happened to the following effect: The patient seemed in absolutely the same condition till she gave a sudden gasp and changed colour; the relative felt her pulse, but could not detect it; in a moment or two the pulse came back steadily, but almost immediately the patient gave one more gasp and the pulse rapidly faded away.

Cerebral hæmorrhage is a rare complication of purpura, so much so that it is not even named in some text-books; and in one of the two cases specially cited by Hilton Fagge the complication was not directly fatal.

The precise position of the hæmorrhage in this case is perhaps not absolutely certain, but the symptoms suggested a cortical extravasation in the arm area, immediately becoming subdural, and extending in the subarachnoid space over the surface of the right hemisphere. As to the immediate cause of death, it seems to have been a medullary lesion; the blood may have gravitated in the subarachnoid space till it pressed on the medulla, but the extreme suddenness of the death suggests an independent medullary extravasation, improbable as such a coincidence may seem.

DISCUSSION.

The PRESIDENT (Sir T. Barlow) said that there was a certain amount of literature showing that, in cases of purpura with a fatal cerebral ending, there was often a considerable blood extravasation into the subarachnoid space. His attention had been directed to this more in connection with febrile purpuras than any other form; and in Sir William Jenner's valuable statistical report on post-mortem examinations of cases of typhus and typhoid fevers, he referred to this point. Some years ago the President had seen a case of extensive purpura in a patient with typhoid fever, some of the mucous membranes being affected. The patient passed into a state of coma, lasting forty-eight hours, but subsequently recovered. She died some time later in a relapse of the typhoid fever, and there was found to be a large effusion of blood in the subarachnoid space and similar hæmorrhagic effusions into other parts, such as the mediastinum and retroperitoneal tissue. One patient whom he had seen was dying from per-

nicious anæmia, and transfusion was performed. In that case there were cortical hæmorrhages such as Dr. Carruthers had suggested.

Dr. J. PORTER PARKINSON said that within the last eighteen months he had seen a case of purpura hæmorrhagica in which there was a large sub-arachnoid hæmorrhage, which was the proximate cause of death. He reminded the members of a paper read before the Royal Medical and Chirurgical Society by Dr. Soltau Fenwick and himself in 1906,¹ in which two very severe cases of the kind were mentioned. One patient was apparently at the point of death, and for some days had been losing blood from the nose, mouth, stomach, and rectum, as well as passing it with the urine. He was very much exhausted, and the pulse was rapid. The case seemed hopeless, but 20 c.c. of polyvalent anti-streptococcic serum were injected *per rectum*. Next day the patient was better. The dose was repeated and the patient ultimately recovered. The man was aged 25, was suffering from phthisis, and had a cavity at the apex of one lung. The other case was very similar, and before treatment the condition of the patient was almost as serious. Such cases were rare, so that he had not had many chances of repeating the treatment. But he had given the serum in another case, which was not so severe, and that patient also had recovered. In simple purpura he had not had such striking results. His experience of calcium lactate and calcium chloride was much the same as the author's—fresh hæmorrhages appeared even while the drugs were being taken. No doubt the pathology of the condition was very obscure. In his cases attempts had been made to cultivate organisms from the blood, but without success. He had little doubt that the disease was due to some form of toxæmia or septicæmia, and that view was supported by the fact that, if searched for, some septic lesion would be found preceding the condition, such as a whitlow, and purpura was not rare in association with phthisis. Thus there was hope from the use of a serum in certain cases.

Dr. CARRUTHERS, in reply, pointed out that, as his case was a febrile one, it had not occurred to him to administer a serum. He had not much hope from treatment by calcium lactate, although in hæmophilia of severe degree he had had good results from it.

¹ *Transactions*, lxxxix., p. 183.

Cerebellar Tumour with Proptosis.

By J. PORTER PARKINSON, M.D., and J. STROUD HOSFORD,
F.R.C.S.ED.

THE extreme rarity of proptosis occurring in cases of cerebellar tumour, or more properly in cases of tumour in the posterior fossa of the skull, is such that as far as I am aware there are only three cases recorded, namely, those of Friedeburg, Van Hell, and Booth. The following case came to the Ophthalmic Department at the London Temperance Hospital on May 17, 1906, and was seen by Mr. Hosford and diagnosed as a "tumour of the cerebellum." The patient was admitted to the medical wards under Dr. Parkinson, where she remained for four months, but as the malady appeared to be very chronic she was removed to the Home for the Dying, Friedenheim, where she died suddenly the next day.

L. V., aged 14, a tall, well-developed girl, had pains in the back of the neck in October, 1905, which lasted on and off, the mother said, for two or three weeks, and she had her tonsils removed. She was not sick. There was no anæmia; patient had never menstruated. In February, 1906, she had "rheumatic" pains in the limbs and back, with headache and sickness, and was attended by a private doctor, who kept her in bed for what the mother called "rheumatism."

During April the patient had two convulsions and the headache ceased, but she gradually began to "see things in a mist," and in the last week of the month she "saw things double," and her mother noticed that "her eyes began to grow out." In the first weeks of May the pains disappeared, but the eyesight became very much worse and she constantly complained of giddiness on sitting up. The mother brought the child to the hospital on May 17 for "spectacles," but she could not walk or even stand without leaning heavily on her mother's arm. The aspect of the face was expressionless, her head thrown back, and the posterior neck muscles firmly contracted. There were no knee-jerks, nor was Kernig's or Babinski's sign or ankle-clonus to be obtained. Sensation was normal, memory good, and hearing, smelling, taste, and speech were natural. Patient was inclined to be emotional at times. The right arm was decidedly weak, both in the grip of the hand and the forearm

muscles, and of this she complained. The eyes were as follows: Great proptosis of each eye, equal on the two sides, so that much of the sclerotic was visible, and the eyelids correspondingly stretched. The lids and conjunctivæ were otherwise natural. There was no œdema, congestion, or chemosis, and the corneæ were natural. There was well-marked paresis of the right external rectus muscle, and the centre of the cornea could never be brought to the mesial line. The left external rectus was weak, but not nearly so marked as the right. There was slight but definite horizontal nystagmus, which disappeared on admission, but reappeared the day before death. Altitudinal motions were normal. Von Graefe's and Stellwag's signs were absent, but Dalrymple's sign (widening of the palpebral fissure) was present. The pupils were equally dilated (8 mm.), and reacted very faintly and slowly to light. The tension was normal and the media were clear. There was in each eye, but more marked in the right, the most intense choked disc and neuro-retinitis accompanied by hæmorrhages (some of which were becoming decolorized). In the macula of the right eye there was a somewhat stellate whitish mass of exudation. Vision was reduced to counting fingers. Examination in the wards revealed *nil* abnormal in neck, chest, or abdomen. The pulse was 98; bowels costive; temperature subnormal; urine normal; and there were no tremors. Treatment consisted of mercury and iodides.

The patient continued in much the same condition until May 22, when, in the early hours of the morning, she had three fits of a general convulsion order, not severe, and accompanied by slight loss of consciousness. These continued at intervals of a day or so. There was no headache or vomiting. In some of the fits there was tonic spasm of the right arm, forearm, and hand, and once or twice the fits started in the right arm. They rarely lasted more than a minute. The notes then ran as follow:—

June 7.—Still has fits daily, and vomiting occasionally of usual cerebral type, but no headache. Asks for glasses. Passed a round worm.

June 11.—No fits since the last note and no more vomiting. Vision: hand shadows. Swelling of nerve head is less, and hæmorrhages are not so evident. Pupils still widely dilated. Weakness and wasting of right upper limb, grip on right side 10, that on left 21. Temperature subnormal.

June 29.—Proptosis and tremors as before. No vomiting or headache; is wasting.

July 12.—Fits daily for last five days. No warning of them. Loses consciousness during fit and remains unconscious for about ten minutes. Twitching begins, in some fits, at the right angle of the mouth and is accompanied by enuresis. Patient cries on recovering consciousness; does not know that she has had a fit; is becoming more drowsy.

August 7.—Patient getting more and more apathetic, and now passes urine and fæces under her. She complains of pains in the right arm.

September 1.—Removed to Friedenheim. Horizontal nystagmus again present. Died September 2 quite suddenly with asphyxial symptoms. Temperature rose to 101·2° F. before removal from wards of London Temperance Hospital on September 1.

Post-mortem, September 3.—Much emaciation. Proptosis not quite so marked as before death, but still very pronounced, although the eye-balls could be pressed back into place. Convergence of each eye. No sign of separation of the cerebral sutures. On opening the cranium the meninges were natural, but there was an escape of a great quantity of intraventricular clear fluid. The ventricles were much dilated and the cerebral cortex flattened and thinned, and the tunics of the optic nerve sheath disturbed. The orbit was natural. Attached to the pia mater on the under surface of the right lobe of the cerebellum was an irregular, flattened, well circumscribed, encapsulated, very firm, pink growth about the size of a large pigeon's egg, and containing old blood-clot in the centre. It pressed upon the restiform body and medulla oblongata on the right side, dipping down so much into the foramen magnum that a piece of the tumour was left behind by the pathologist during the process of removing the brain. The whole growth appeared to have been wedged between the bony wall and the right side of the medulla.

Microscopical examination showed the growth to be a fibro-psammoma. There was a small post-mortem clot in the right lateral sinus, far back; the other organs in the body were natural.

It is of interest to compare the salient points of the only other three cases in which exophthalmos coexisted with an intracranial growth, which was apparently the cause of this symptom.

Booth's¹ case occurred in a girl, aged 10, who suffered from headache and vomiting, with giddiness and general wasting. There was papillitis, followed by optic atrophy. The proptosis was slight, and only appeared seventeen days before death. There was paresis of the left arm and paralysis of the right sixth nerve. At the necropsy a large angio-sarcoma

¹ *Journ. of Nerv. and Ment. Dis.*, 1890, xvii., p. 684.

was found in the right lobe of the cerebellum pressing on the fourth ventricle, pushing the medulla to the left and pressing on the right crus of the cerebellum. There was marked hydrocephalus.

Van Hell's¹ case was in a soldier, aged 25, who had suffered for a month before being seen with weakness of gait, dimness of sight, and occipital headache. There was slight exophthalmos, the pupils were dilated, but reacted sluggishly. Optic neuritis was present. There was paralysis of the right side of the face and incoördination of the legs, with increased reflexes. Fits, with forced movements from left to right, occurred from time to time. Later there appeared ptosis on the right side, sleepiness, slow pulse, and incoördination of the arms. At the necropsy there was found a growth in the superior vermiform process pressing on the left cerebellar hemisphere. Much hydrocephalus was present.

Friedeburg² describes a case in a girl, aged 23, who had suffered for one and a half years from occipital headache and vomiting. She had exophthalmos with dilated pupils and double optic neuritis. There was a glioma the size of a chestnut attached to the under surface of the cerebellum and involving the fourth ventricle. Extreme hydrocephalus was present. In these three cases, as in the one recorded by us, the exophthalmos cannot be accounted for by local causes in the orbit, thrombosis of the cerebral sinuses, or thyroid disease, for there was no evidence of any of them at the necropsy. Exophthalmos must be, therefore, an occasional though rare symptom of a cerebral tumour. To what condition can it be due? The cases are too few to give an opinion upon, but in all there was a tumour of the cerebellum extending towards the fourth ventricle, and probably interfering with the exit of the cerebro-spinal fluid and producing hydrocephalus. This does not lessen the difficulty, as tumours in this situation are not rare and are not usually accompanied by exophthalmos, though hydrocephalus is generally present.

DISCUSSION.

Mr. HOSFORD said that when the patient first came under observation the right disc exhibited 4 mm. of swelling and the left 3 mm., so that the more marked papillitis was on the same side as the tumour. That was six weeks after the initial eye symptoms in the second week in March, when the mother

¹ *Neurol. Centralbl.*, 1892, xi., p. 381.

² *Berl. klin. Wochenschr.*, 1895, xxxii., p. 719.

noticed that there was dimness of vision. The disc remained swollen until June 10. On July 20 the swelling was reduced to 1 mm., and on August 10 the discs were nearly flat, but there was very much puckering. There was no sign of hæmorrhage nor of pigment on July 20. The eye symptoms never completely subsided until about a week before the patient died. The proptosis, he thought, was probably due to irritation of the sympathetic and not due to distension of the ventricles; he had not seen anything like it in hydrocephalus. He suggested that the sympathetic was affected by a meningitis which probably spread down the cord. He based this suggestion on the fact that in a syphilitic case which he had observed, there was much pachymeningitis about the cord and also proptosis on the right side. Dr. Paton recently, in a valuable series of 250 cases from the Queen Square Hospital, expressed his opinion that Parinaud's theory, which invoked general œdema of the brain tissues as a cause of intense choked disc, was correct. But he (Mr. Hosford) thought the cause lay in the increased subtentorial pressure due to the binding down by the tentorium of the cerebellum. In the recent Queen Square statistics the papillitis was often more marked on the side of the tumour than on the other side, but Dr. Hughlings Jackson had brought forward valuable cases in which he showed that the optic neuritis was more marked on the side opposite to the tumour.

The PRESIDENT remarked that it seemed to him that the question whether hydrocephalus itself, if of extreme degree, might not be a cause of proptosis was worthy of consideration.

Sir DYCE DUCKWORTH said that he had long held that there were cases of exophthalmos which had nothing to do with the thyroid body, and in such cases he regarded the symptoms as due to a central neurosis in the medulla.

Dr. PORTER PARKINSON, in reply, said that the hydrocephalus was extreme, although there was no evidence of it during life; and in all the other similar cases there was hydrocephalus of extreme degree. At the post-mortem examination the orbits were well explored, but there was no evidence of pressure upon the orbital plates or frontal bone.

Clinical Section.

April 10, 1908.

Sir THOMAS BARLOW, Bt., K.C.V.O., President of the Section, in the Chair.

Fatal Lymphocythæmia in Early Life.

By J. GRAHAM FORBES, M.D., and FREDERICK S. LANGMEAD, M.D.

It is only in comparatively recent years that attention has been drawn to the existence of a blood-condition occurring among children and adults essentially differing in its clinical course, hæmatology, and morbid anatomy from other forms of blood-disease. The scope of the present paper has reference only to such type as it occurs in early life, and the title lymphocythæmia points to the chief distinguishing feature of this invariably fatal condition. The disease is characterized by progressive anæmia, associated with a tendency to hæmorrhages in the form of purpura, conjunctival or retinal hæmorrhages, epistaxis, bleeding from the gums, intestinal hæmorrhage and melæna, and less commonly hæmatemesis or hæmaturia.

There is usually, but not invariably, general enlargement of the superficial glands, some increase in size of the spleen and liver, and occasionally the kidneys are felt to be enlarged. The onset is somewhat indefinite, the history denoting an increasing pallor and languor for some weeks; and the duration, dating from the first illness observed, varies from a week in the most acute to three or four months in the more prolonged cases.

Examination of the blood provides the only certain means of diagnosis, and yields a picture differing fundamentally from that presented by other blood-diseases. The chief distinction lies in the existence of a condition of absolute or relative lymphocythæmia, according to the total leucocyte count. The variation in the number of leucocytes, as will be shown, is often considerable, ranging from some hundreds of thousands, or less

than 100,000, to below 10,000, with even a leucopenia; but whatever the total leucocyte count may be, there is *invariably an absolute or relative increase in the number of lymphocytes*.

Together with the lymphocythæmia there occurs a diminution in the number of the red corpuscles to between one and two millions or lower, and a variation in the percentage of hæmoglobin yielding a colour index above or below the normal.

The temperature is irregularly raised, but in the more prolonged cases during temporary improvement falls to normal.

The urine frequently contains a trace of albumin, and occasionally casts. Hæmaturia rarely occurs.

During the course of the illness the condition of the glands, spleen, and liver may alter considerably, at one time increasing, at another diminishing in size. A decrease in size is common during periods of temporary improvement and shortly before death. Epistaxis, severe hæmorrhage from the gums and alimentary tract are not uncommon towards the end. Coincident with the downward progress of the case there is increasing pallor and feebleness; the red corpuscles may fall to half a million per cubic millimetre and the leucocytes to less than 10,000. This ante-mortem fall in the leucocytes is a common feature, but there is still a relative excess in the number of lymphocytes.

Post-mortem examination verifies the slight enlargement of the superficial glands observed during life, and in addition there is usually found an increase in size of, and hæmorrhages into, the mesenteric and retroperitoneal glands. The heart is dilated and scattered with hæmorrhages on the epicardial and endocardial surfaces. Subpleural and pulmonary hæmorrhages may also be present. The liver and spleen show some enlargement, the former being extremely pale. The kidneys are, as a rule, greatly enlarged and occasionally weigh three or four times the normal. They show a very pale surface extensively mottled with hæmorrhage, which may involve the whole cortex and destroy the definition between cortex and medulla; the extreme yellow pallor of the pyramids forms a strong contrast. The stomach and intestines show no ulceration, but frequently contain blood and display a few submucous hæmorrhages. Peyer's patches are invariably much swollen. The bones show no changes. The marrow is seldom increased in amount, and its colour varies from dark to pale red. Extensive hæmorrhages may be found underlying the dura mater.

Microscopical examination shows considerable hyperplasia of lymphocytes in the adenoid tissues and bone marrow, and lymphocytic invasions

of the spleen pulp, the portal canals of the liver, and the interstitial tissues of the heart, pancreas and testicle, and to an extreme degree in the kidneys.

In the literature of the past ten years is to be found an increasing number of cases which fall into the same group as those on which this paper is based. Rose Bradford and Batty Shaw [10], in 1898, described five cases of acute lymphocythæmia, including four adults. The fifth case was that of a boy aged 7, who died after an illness of seven weeks. The features of the case were, briefly, purpura, swollen gums, enlarged cervical glands and spleen, and melæna. Temperature 104° F. to 105° F. Urine contained a trace of albumin.

BLOOD-EXAMINATION.

Hæmoglobin ...	...	= 26 to 36 per cent.
Red blood-corpuscles ...	...	= 1,500,000 per cubic millimetre.
White blood-corpuscles	...	= 34,000 to 68,000 per cubic millimetre.
Small lymphocytes ...	...	= 12·2 per cent.
Large lymphocytes ...	...	= 61·8 „

In 1904 Frederick Taylor [11] recorded the case of a boy aged 10, whose illness covered a period of three months. Two blood-examinations made three or four weeks before death, at intervals of ten days, gave the following results:—

Red blood-corpuscles ...	=	5,600,000 to 4,400,000 per cubic millimetre.
White blood-corpuscles ...	=	15,000 to 50,000 „ „
Small lymphocytes ...	=	46·6 per cent. to 94 per cent.
Large lymphocytes ...	=	9·3 „ 3 „

Post mortem there were found enlargement of the parotid, lachrymal and submaxillary glands, marked increase in size of the thymus (weight = 386 grm.), also of the liver (weight = 2,300 grm.), spleen (508 grm.), and kidneys (1,100 grm.).

Microscopically the kidney showed extreme lymphocytic and hæmorrhagic invasion; the heart, spleen, liver, suprarenal, and thymus glands were all the seat of infiltration by lymphocytes. A rabbit inoculated with the heart's blood died in one month of pneumococcal septicæmia.

On account of the large size of the thymus in this case and its persistence in those recorded by Bradford and Batty Shaw, the author suggested the possibility of this organ being the primary seat of disease.

Hutchison [7], in his Goulstonian lectures (1904), under the head of lymphatic leukæmia in childhood, alludes to the scanty attention devoted

to the condition until recent years, and quotes cases collected by various authors up to that date. Thus McCrae described one in 1900, and gave references to thirteen others under the age of 10. Gilbert and Weil, among sixty recorded up to 1899, found five between 1 and 10, and seventeen between 11 and 20. Guinon and Jolly, in 1899, described the disease as represented by three types:—

(1) Profound anæmia with general glandular enlargement and hæmorrhagic tendency in the later stages.

(2) Hæmorrhagic tendency from the onset, resembling infective purpura.

(3) Pseudo-scorbutic cases in which lesions of the buccal cavity were the chief feature.

Although the frequency of lymphatic leukæmia in childhood could not be satisfactorily explained, Hutchison associates it with the greater activity of the adenoid tissues in early life and their liability to pathological changes. He argues that the frequency of infection, particularly through the throat, in childhood may explain the possible infective origin of the disease. A reference is also made to the view that the condition may be due to an overgrowth of the original mother cells, the supposed progenitors of lymphocytes and myelocytes, constituting a return to the foetal stage previous to the appearance of myelocytes. He recognizes the difficulty of assigning a limit to acute cases, which may vary from five to ten weeks in duration, and states that in the acute cases the large lymphocyte, and in the chronic the small lymphocyte, tends to predominate.

Cabot [2] observed a marked ante-mortem fall in lymphocytes in a septicæmic case, and quoted other cases in which this fall occurred as the result of intercurrent disease. McCrae [8], in 1905, out of a total of 17,100 admissions at the Johns Hopkins Hospital, collected thirty-seven cases of leukæmia, of which five were acute, and of these one only was in a child aged 3.

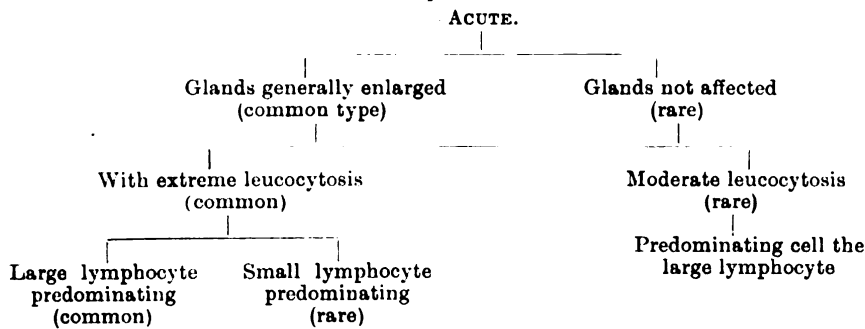
He summarizes the blood-counts of forty-five cases, including these five, as follows: average colour index = 0.94; in eighteen cases, over 1; in twenty, under 1; and in six, approximately 1. Red blood-corpuscles, over 2,500,000 in nine cases; between 1,500,000 and 2,500,000 in thirteen; between 1,000,000 and 1,500,000 in twelve; and below 1,000,000 in ten. He considers that Neumann's contention that the marrow is primarily involved is supported by recent work, and that the severe anæmia of these cases points to such an origin.

Donnan [4] (1905) attributes the absence of palpable glands and the

moderate splenic enlargement to the rapid course of the disease, which allows no time for the glands to react, and suggests that the marrow is the primary seat of disease.

Whipham and Leathem [13], in 1906, described two cases in girls aged $2\frac{1}{2}$ and 8. Duration, three months and one month respectively. Clinical condition: Anæmia, purpura, slight glandular enlargement, definite enlargement of spleen and liver. Leucocyte count, in one, 25,000, falling to 8,300; in the other, 20,000. In each case the large lymphocytes were in excess, and post mortem marked lymphocytic invasion of the various organs was found.

In referring to other cases they divide the various forms met with as follows :—



More recent work on the subject is by Emerson [5], who published an account in the *Johns Hopkins Bulletin*, 1907. He classifies the disease under the following types without particular reference to age incidence :—

Form 1 : Type like chronic leukæmia, but more acute.

Form 2 : Acute infectious type, simulating acute streptococcal septicæmia in all but the absence of streptococci.

He quotes Rose Bradford, Barlow and Osler as holding the view that the blood-changes which occur are merely evidence of reaction. He also gives three cases reported by Holst, in which streptococci were obtained on cultivation—in one, from knee-joint, glands and blood; and in another from the bone marrow only. Therefore it is argued that this case was due to primary streptococcic infection of the bone marrow. Leucocyte counts are given of two of the cases: (1) 8,300 per cubic millimetre, 77 per cent. large lymphocytes and 14 per cent. small lymphocytes; (2) 8,400 per cubic millimeter, 93 per cent. large mononuclears.

Form 3 : Hæmorrhagic type; under this heading is placed Shattock's case of infective purpura and cases characterized by general hæmorrhages,

hæmatomata or cerebral hæmorrhages, usually fulminant, and associated with extreme anæmia.

Form 4: Acute cachectic type, marked by languor, loss of flesh, dyspnœa and prostration, but few petechiæ, intense pallor and slight jaundice.

Emerson also refers to pseudo-scorbutic and pharyngeal forms, the latter starting as gangrenous ulceration of the throat, and states that others are associated with diarrhœa and vomiting, or with acute nephritis at the onset. He describes a case and quotes others showing the considerable variation and the frequent ante-mortem fall in the numbers of leucocytes.

CASES:

We have collected twelve cases illustrating fatal lymphocythæmia in early life. Eleven of these cases were admitted to the Hospital for Sick Children, Great Ormond Street, and one to the Paddington Green Children's Hospital. Nine have occurred in the last three to four years out of an approximate total of 1,200 post-mortem examinations, constituting 0·75 per cent., and have been under the observation and examination of one or both of us.

CASE I.

W. J., aged 2½, was admitted to the Hospital for Sick Children on April 12, 1894, under the care of Sir Thomas Barlow, with a history of two to three weeks illness following an attack of bronchitis. On admission, the boy was described as well nourished and of fair complexion; his face was pale and the respiration hurried. The throat showed septic tonsillitis. Temperature, 99° F.; pulse, 120; respiration, 70. Ophthalmoscopic examination showed retinal hæmorrhages in the left eye. The glands in the neck, axillæ, and groins were slightly enlarged. On examination of the thorax the area of cardiac dulness extended above the lower border of the second left costal cartilage and to the mid-line of the sternum. The apex beat coincided with the nipple, and the heart sounds were normal. There was impairment over the front of the upper lobe of the left lung, and scattered *râles* were heard over both lungs behind. The abdomen was distended, the spleen was enlarged, reaching to the level of the umbilicus, and the liver was much increased in size. Blood-examination (tabulated later) showed a high degree of lymphocythæmia. During the subsequent course of the case the patient became steadily worse; hæmorrhages occurred from the gums; blood frequently appeared in the stools, and there was occasional epistaxis. The urine

contained urates and uric acid crystals and casts, but there was no mention of the presence of albumin. The glands in the neck increased in size and the patient died on June 4, ten weeks after the first onset of illness.

BLOOD-EXAMINATIONS.

	April 18	May 3	May 23	May 31
Hæmoglobin	35 per cent.	—	33 per cent.	35 per cent.
Colour index	0·58	—	0·58	0·87
Red corpuscles per cubic millimetre... ..	3,000,000	3,000,000	2,800,000	2,000,000
Leucocytes	1,000,000	272,000	622,000	500,000

DIFFERENTIAL COUNT (April 18).

Polymorphonuclears	1·5 per cent.	=	15,000 per cubic millimetre.
Large mononuclears	0·8	„	= 8,000 „ „
Small lymphocytes	56·0	„	= 560,000 „ „
Large lymphocytes	41·7	„	= 417,000 „ „

NUCLEATED RED CELLS.

Four normoblasts seen in counting 1,100 white blood-corpuscles.

Post-mortem Examination.—Body wasted. Brain normal in appearance. Blood pale and milky-looking. Lymphatic glands in the cervical region, mesentery and retroperitoneum were enlarged, pale and gelatinous on section; but those in the mediastinum and at the roots of the lungs were not enlarged. There were several necrotic areas in the cervical glands. The heart was normal; the lungs were œdematous at the bases and there were ecchymoses over the parietal pleuræ. The gastric mucosa was blood-stained, and the intestines showed prominent Peyer's patches and submucous hæmorrhages below the ileo-cæcal valve. The liver was firm and paler than normal, weighing 27½ oz. The spleen weighed 10 oz., its capsule was thickened and adherent to the anterior abdominal wall, the splenic substance was tougher than normal, and there appeared to be an increase in the fibrous tissue. The kidneys were much enlarged, very pale and firm in structure. In parts the cortex could not be distinguished from the medulla and there were hæmorrhages in the pyramidal portions; the capsules stripped off easily. The ureters, bladder and testicles were normal. The marrow was dark coloured and normal in appearance.

Microscopical Appearances of Affected Organs.—Kidney: The cortex and medulla were equally crowded with an invasion of lymphocytes, in the mass of which the greater number of tubules and glomeruli were

obscured or appeared as islands scattered here and there. In addition to this lymphocytic invasion several hæmorrhages were seen in the medulla. Liver: The connective tissue about the portal canals was crowded with lymphocytes, which were to be found everywhere filling the intralobular capillaries. Spleen: The capsule was slightly thickened, and under it appeared a zone of congestion; the rest of the splenic tissue was thickly filled with lymphocytes, which prevented the Malpighian bodies from being defined. Thymus: Congested and densely packed with lymphocytes, but there was no marked increase in the amount of fibrous tissue.

CASE II.

Eleanor M. H., aged 3 years and 2 months, admitted to the Hospital for Sick Children on July 3, 1896, under the care of Sir Thomas Barlow, with a history of only a few days illness marked by palpitation of the heart, shortness of breath, languor and headache. She had been a weakly child from birth, had measles at 18 months and afterwards whooping-cough, and she had recently been getting thin. Her mother had had eleven children (four of whom died of consumption), and there had been two miscarriages. On admission the child was thin and very anæmic; there were purpuric spots all over the body. The lymphatic glands in the neck, axillæ and groins were slightly enlarged, but there was more marked enlargement of the thoracico-parietal glands in the middle of the right axilla. Examination of the chest showed that the cardiac dulness extended on the left to one finger's breadth outside the nipple line, upwards to the third intercostal space, and to the right margin of the sternum. The apex beat was felt just outside the left nipple line and a systolic bruit was audible at the apex. Nothing abnormal was found in the lungs. The edge of the liver could be felt two fingers' breadth below the right costal margin. The spleen was very hard and enlarged, reaching to the level of the umbilicus in the left nipple line. In addition, tumours could be felt in each lumbar region occupying the position of the kidneys, and hard enlarged glands were palpable in the left iliac fossa. The urine, on admission, contained no albumin; specific gravity 1015, acid. Only an imperfect examination of the blood is recorded. Hæmoglobin = 38 per cent. Proportion of white to red corpuscles 1 to 31. During the subsequent course of the case the patient became steadily worse and more anæmic. For the first fortnight the temperature was irregularly raised (99° F. to 101° F., 102° F., and 103° F.), and later it became lower with occasional pyrexial

rises. The liver and midaxillary glands increased in size, and the spleen remained much the same and felt very hard and irregular; the mass felt in the left lumbar region became larger. Blood was observed in the fæces on July 25; the urine frequently contained albumin in traces and sometimes in greater quantity. During the last ten days of life the temperature fell to 98° F. and 99° F., and was occasionally subnormal. On August 3 vomiting and œdema of the feet and hands started, and death occurred four days later, after an illness of five to six weeks duration.

Post-mortem Examination.—Lymphatic glands: Cervical slightly enlarged and pale; mediastinal enlarged and of a creamy colour, dotted with small hæmorrhagic areas; mesenteric normal and pale; retro-peritoneal somewhat enlarged and very pale, with dark hæmorrhagic areas—they extended in a continuous chain along either side of the vertebral column and along the iliac vessels to the inguinal region. Lungs: Bound down by a few adhesions, crepitant throughout, and scattered with small hæmorrhages in the substance and under the pleura. Heart: Right side dilated; its surface was mottled all over with small subpericardial hæmorrhages, the valves were healthy, and there were a few endocardial hæmorrhages in the right and left auricles. Kidneys: Both much enlarged and lobulated, the left weighing 7½ oz. and the right 6½ oz., very pale and whitish yellow in colour, scattered with hæmorrhagic purple areas on the surface. On section the cortex and pyramids could be easily defined, and were of a pale creamy colour in contrast to the hæmorrhagic areas, which varied in size from a pin's head to a threepenny piece. The capsules stripped easily. The pelves and ureters were normal.

Microscopically the kidneys showed an extreme infiltration with lymphocytes, which widely separated the tubules. The glomeruli were enclosed by large areas of dense small-celled infiltration, which did not extend under the capsules. The tubules and glomeruli in themselves appeared unaltered. The liver was enlarged, very pale and translucent on section, and scattered with opaque yellowish spots, but no hæmorrhages. The glands of the hilum were increased in size and dotted with hæmorrhagic areas. Microscopically the organ showed fatty infiltration of the cells, more particularly at the periphery than in the centre of the lobules. There were well-marked collections of lymphocytes in the interlobular spaces spreading into the lobules between the cells. The spleen was much enlarged and firm, weighing 7 oz., pale pink in colour and contained no masses. Microscopically it showed a general

infiltration with lymphocytes, the capsule was slightly thickened, but there was no obvious thickening of the trabeculæ. The stomach was normal, but the small intestines contained blood-stained fæces and submucous hæmorrhages. The pancreas and suprarenals appeared normal.

CASE III.

Dorothy B., aged 10 years and 11 months, was admitted to the Hospital for Sick Children on June 16, 1899, under the care of Dr. Penrose. Though ailing for some months with occasional epistaxis, she had not been definitely ill until one month previous to admission; during this time she complained of pain in the lower limbs. For two weeks the gums had been swollen and bleeding, and within the last few days a purpuric eruption had been observed. With reference to family antecedents, there was a doubtful history of syphilis in the father, and the mother had three miscarriages previous to the patient's birth. On admission the child's face was of a yellowish muddy pallor. Temperature 98° F. to 100° F.; pulse, 128; respiration, 18. Purpuric spots were scattered over the trunk and limbs, there were hæmorrhages from and into the gums. Ophthalmoscopic examination of the eyes showed retinal hæmorrhages. There were no enlarged glands, nor could anything abnormal be discovered on physical examination of the thorax. In the abdomen the edge of the enlarged liver could be felt reaching to the level of the umbilicus; the spleen could be felt, but was not much enlarged. Urine, specific gravity 1020, and contained no albumin. On the three days following admission bleeding occurred from the gums, and there was both epistaxis, which was difficult to control, and melæna. The temperature varied between 99° F. and 103° F. Death occurred on the fourth day, after an illness of altogether four to five weeks duration.

Post-mortem examination revealed no enlargement of the lymphatic glands, with the exception of one in the portal fissure of the liver. The lungs showed nothing abnormal beyond a few subpleural hæmorrhages. In the heart hæmorrhages were present on the visceral surface of the pericardium, under the endocardium, also in the substance of the cardiac muscle, which was elsewhere pale. On the inner wall of the aorta occurred several opaque yellow patches. The right ventricle was dilated and flabby. The stomach showed several small hæmorrhages into the mucous membrane. The liver was enlarged and weighed 44 oz. On section it was of a tawny yellow colour, mottled throughout with white patches, due probably to collections of lymphocytes. The spleen was

softer than normal, somewhat enlarged, and weighed $5\frac{3}{4}$ oz. The Malpighian corpuscles were not conspicuous. The kidneys were both enlarged, weighing $4\frac{1}{8}$ oz. and $4\frac{3}{4}$ oz. respectively. Their surface was pale, with numerous projecting red bosses. On section the substance was very pale, scattered with many round hæmorrhages enclosed by white areas measuring 1 mm. to 3 mm. in diameter. The definition between cortex and pyramids was lost. The suprarenals and pancreas were normal. Section of the sternum showed that the cancellous tissue was very red. Although there is no record of the blood-condition obtainable in this case, yet its clinical features and the appearances of the organs revealed by post-mortem examination justify its inclusion in the group of cases reported in this paper.

CASE IV.

This case was that of a girl, D.R., aged 4, who was admitted into the Hospital for Sick Children, under the care of Dr. Lees, on July 19, 1904. She was said to have got thinner and paler for five months, during which time she had been sometimes in bed and sometimes running about, but never quite well. Two months before admission she had had a bout of diarrhœa and vomiting, passing blood and slime by the bowel, and vomiting blood for about fourteen days. Since then the pallor had been accentuated. She had had no previous illnesses of importance, and there was nothing relevant in the family history.

On admission she was seen to be extremely anæmic and showed evident signs of recent wasting. The temperature was 102° F., the pulse-rate 148, and the respirations 48. By the ophthalmoscope old punctate hæmorrhages could be seen in the retinae, especially in the right. The tonsils were not enlarged. The glands of the neck, groins and axillæ were moderately enlarged. Examination of the chest revealed dilatation of both sides of the heart, and a loud systolic bruit could be heard at all areas. The abdomen was distended in its upper zone, and the liver edge was felt about two fingers' breadth below the costal margin, whilst the spleen was easily palpable. There was neither blood nor albumin in the urine, and now no blood in the motions.

For the first month after admission she steadily improved, while taking 10 gr. of dialyzed iron three times a day. The heart regained its normal size, whilst the liver and spleen both receded, the former extending to one finger's breadth beneath the costal margin, the latter being barely palpable. Her colour improved and her appetite and general condition were certainly better. The temperature, however, although it

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reached normal during the first week, remained irregular, and there were occasional rises to 103° F. From this time onwards she again began to go down-hill, and by August 30 the spleen reached nearly to the umbilicus, and the glands were also very much larger. On September 1 the uniformly enlarged spleen is noted as having reached the umbilicus, and the liver was three fingers' breadth below the costal margin. The lymphatic glands were still larger, and formed definite masses in the axillæ, groins, anterior and posterior cervical triangles on both sides, the occipital region and left inguinal region. Examination of the chest revealed dulness behind the manubrium and in the inter-scapular regions, which was also attributed to glands. There were dilatation of the superficial veins and œdema of the face, chiefly on the left side.

Two minims of liquor arsenicalis were now added to the dialyzed iron, and from this time onwards the spleen, liver and glands diminished in size, although the child's condition was evidently rapidly getting worse, and she died with far smaller palpable lymphatic structures than she had had previously. The temperature chart showed a gradual irregular ascent, reaching 104° F. on September 10. It remained there until September 15, when it fell to 96° F. just before death. No hæmorrhages occurred whilst she was under observation.

BLOOD-EXAMINATIONS.

	August 1	August 11	August 29	September 14
Colour index	0·7	—	—	0·78
Hæmoglobin	38 per cent.	45 per cent.	—	22 per cent.
Red corpuscles	2,584,000	3,700,000	2,284,000	1,424,000 per cubic millimetre
Leucocytes	5,000	40,000	61,000	14,000 „ „

DIFFERENTIAL COUNT.

	Per cent.	Per c.mm.	Per cent.	Per c.mm.	Per cent.	Per c.mm.	Per cent.	Per c.mm.
Polymorphonuclears	30·0 =	1,500	31·5 =	12,600	0·4 =	244	2·0 =	280
Large mononuclears	4·0 =	200	6·0 =	2,400	—	—	1·6 =	224
Small lymphocytes	44·0 =	2,200	45·0 =	18,000	50·6 =	30,866	69·2 =	9,760
Large lymphocytes	22·0 =	1,100	16·5 =	6,600	49·0 =	29,890	28·0 =	3,970
Eosinophiles	—	—	1·0 =	400	—	—	—	—
Myelocytes	—	—	—	—	—	—	0·4 =	56
	5,000		40,000		61,000		14,000	

Red corpuscles show defective staining and a tendency to chromatophilic changes.

Post Mortem.—To the naked eye the kidneys showed the most obvious pathological change. They were both greatly enlarged, the right weighing 5 oz., 7 dr., the left 7 oz. 1 dr. The renal structure

was blurred, so that the contrast between the cortex and medulla was ill defined. The greater part of the kidney was pale in colour, the apices of the pyramids being almost white, but in the cortex were numerous bright red hæmorrhagic areas, which gave a curious mottled appearance. The capsule stripped readily, and beneath it on the surface of the cortex large irregular patches of hæmorrhage alternated with pale-coloured areas. The glomeruli were deeply congested, and stood out as red spots, from which in some places hæmorrhage had spread into the surrounding cortex. Grey irregular lymphoid patches could be detected about the pyramidal bases. The liver was slightly enlarged and was firm; it cut toughly on section. There was no visible change. The spleen was moderately enlarged and firm, but otherwise was not obviously abnormal. There was general enlargement of lymphatic glands up to the size of an acorn, those in the thorax and abdomen and behind the peritoneum participating. They were fleshy and deep red in colour, but showed no other macroscopic change. The bone marrow was normal in amount and consistency and bright red in colour. There was no oral sepsis, nor was there any lesion in the alimentary tract which could have been the source of the blood in the vomit and motions.

Pathological Report.—Cultivations taken at the time of the autopsy from the heart's blood and spleen yielded pure growths of a short, chained streptococcus. A film taken from the femoral marrow showed the cells to be composed almost exclusively of small and large lymphocytes with comparatively but few polymorphonuclears, eosinophiles and nucleated red cells; a few short streptococci were also seen. Cervical glands on microscopical examination showed the medullary portion to be much engorged. The cortex was crowded with lymphocytes, which also invaded the capsule and surrounding connective tissue, so that the whole gland was divided into hæmorrhagic and lymphocytic areas. The spleen was much engorged and scattered with irregular collections of cells, chiefly composed of small and large lymphocytes which obscured the definition of the Malphigian bodies. In the kidney the interstitial tissue was literally crammed with lymphocytes, particularly that of the cortex, where remnants of tubules and glomeruli appeared as irregularly scattered islands. In addition there were large areas of hæmorrhages which with the lymphocytic infiltration gave the red and white mottling visible to the naked eye. The cortical tubules contained masses of cell debris and cell casts, and the glomeruli, though completely surrounded by lymphocytes, showed no cell invasion penetrating the capsules. The liver was scattered with small lymphocytic foci, particularly about the

portal canals. The hepatic cells showed a considerable amount of fatty infiltration; the capillaries beneath the surface were congested, and presented but little or no invasion by lymphocytes.

CASE V.

This case was that of a male, A.H., aged $1\frac{1}{2}$, who was admitted on November 6, 1904, under the care of Dr. Lees. The mother said that he had always been pale, but had become much more so for the few weeks preceding admission. Eight days before he had developed a purpuric rash, and four days later epistaxis. There was no family history of hæmophilia. When examined he was found to be a pale but fairly well nourished child, with some puffiness of the face and eyes, but no general œdema. The skin, especially that of the lower extremities, was stippled by a purpuric eruption, some spots of which were bright red, others fading. There were also a few large ecchymoses. When the mouth was opened a swelling could be seen on the inner side of each cheek, evidently produced by hæmorrhage beneath the buccal mucosa. The tonsils were moderately enlarged and there was general slight enlargement of the lymphatic glands.

The spleen reached to two fingers' breadth beneath the costal margin, the liver to one and a half fingers' breadth. There was a trace of albumin but no blood in the urine.

The blood-count on this occasion was as follows: hæmoglobin, 32 per cent.; red corpuscles, 2,554,000; white corpuscles, 3,000 per cubic millimetre.

He was considered to be suffering from secondary anæmia, for which iron was given. By November 22, *i.e.*, fourteen days after admission, his colour had so much improved and his general condition was so much better that he was to have been discharged, but from this time he began to get worse. On December 1 he was distinctly more anæmic, and a blood-examination showed: hæmoglobin, 20 per cent., red corpuscles, 1,839,000; white corpuscles, 20,000, to which the lymphocytes contributed 77 per cent. On December 8 the pallor was more obvious; fresh purpura occurred, and there was some melæna. The spleen now reached to the level of the umbilicus. The glands were larger, and the liver edge was three fingers' breadth below the right costal margin. A blood-examination gave: hæmoglobin, 15 per cent.; red corpuscles, 1,106,000; white corpuscles, 83,000, of which 91 per cent. now were lymphocytes. The next day he died. The temperature was irregular, varying from

100° F. to 98° F., and occasionally rising abruptly to 103° F. or to 104° F.

BLOOD-EXAMINATIONS.

	November 8		December 1		December 8
Colour index ...	0·68	...	0·54	...	0·68
Hæmoglobin ..	32 per cent.	...	20 per cent.	...	15 per cent.
Red corpuscles ...	2,554,000	...	1,899,000	...	1,106,000 per cubic millimetre
Leucocytes ...	3,000	...	20,000	...	83,000 „ „

DIFFERENTIAL COUNT.

			Per cent.	Per c.mm.		Per cent.	Per c.mm.
Polymorphonuclears ...	...	...	20·4 =	4,080	...	4·8 =	3,984
Large mononuclears ...	...	...	1·6 =	320	...	4·0 =	3,420
Large lymphocytes ...	...	...	16·4 =	3,280	...	8·8 =	7,240
Small lymphocytes ...	...	...	60·6 =	12,120	...	82·1 =	68,143
Eosinophiles ...	...	...	1·0 =	200	...	0·2 =	166
Basophiles ...	...	...	—	—	...	0·1 =	83
				20,000			83,000

There were no marked changes in the red corpuscles. No myelocytes were seen.

Post Mortem.—The kidneys, liver and a mesenteric gland were the only organs which it was possible to examine. The kidneys were enlarged, weighing $1\frac{3}{4}$ oz. each. They were pale and mottled with hæmorrhages, especially in the cortices, and closely resembled those in the case just described, but to the naked eye were less grossly affected. The liver was large and showed small grey areas, but differed little from the normal. The mesenteric gland was enlarged, red and fleshy.

Pathological Report.—Owing to the restricted nature of the autopsy no direct examination for cultural purposes was possible. Some blood was obtained from the right side of the heart by puncture through the skin, but a contaminating growth resulted on cultivation. Microscopical examination of the kidney showed that the interstitial tissue was invaded by closely packed collections of lymphocytes, separating off tubules and glomeruli, not, however, to the same extent as in the previous case (D. R.). In the pyramidal portion this cell invasion was more noticeable in the neighbourhood of the blood-vessels, which were closely invested by a sheath of lymphocytes, and also along the walls of the calices of the pelvis; one arteriole was seen to be plugged by a lymphocytic mass. The kidney substance was much congested and dotted with small interstitial hæmorrhages. Many of the cortical tubules were plugged with debris and necrotic cells. The liver was scattered with large collections of lymphocytes, which occurred chiefly about the portal canals, forming irregular

masses of cells in the surrounding tissues, and also widely distributed under Glisson's capsule. The hepatic cells showed slight fatty infiltration. The mesenteric gland was much congested and stuffed with lymphocytes, especially in the cortical portion, where the follicular arrangement was lost. The strands of connective tissue were also invaded by lymphocytes.

CASE VI.

This case was that of a boy, H. S., aged 3, who was admitted into the hospital on January 29, 1906, under the care of Dr. Voelcker. The history given by the mother was that for eight weeks he had suffered from "a severe cold, and had been treated by the doctor for mumps." She had noticed that he had been getting increasingly paler, but had herself noticed no glandular swelling. He was an extremely pale, restless and irritable child. The lips were excoriated and bleeding, and subcutaneous hæmorrhages had occurred both around each ear and also superficial to the cartilage of each pinna. There were definite bruises about the ankles and a few purpuric spots scattered all over the body. The lymphatic glands in the cervical triangles were enlarged to the size of an acorn, whilst the axillary and inguinal glands were also enlarged, but to a less extent, and all were freely movable. The epitrochlear glands were distinctly enlarged, and from them a chain of glands could be traced upwards along the course of the brachial arteries. The tonsils were considerably enlarged. No large buccal hæmorrhages were seen, but a few petechiæ were present on the palate and inside the cheeks. The spleen reached about two fingers' breadth below the costal margin; the liver could just be felt. The urine contained a trace of albumin but no blood. On the next day retinal hæmorrhages were seen in each eye. The patient became more restless and died about forty-eight hours after admission.

BLOOD-EXAMINATION.

Hæmoglobin	...	...	...	...	32 per cent.
Colour index	...	...	...	...	1·1
Red corpuscles	...	...	...	...	1,340,000 per cubic millimetre.
Leucocytes	...	...	...	...	14,000 " "

DIFFERENTIAL COUNT OF 300 LEUCOCYTES.

Polymorphonuclears	...	...	1·7 per cent.	=	238 per cubic millimetre.
Large mononuclears	...	...	1·7 "	=	238 " "
Small lymphocytes	...	...	94·0 "	=	13,160 " "
Large lymphocytes	...	...	2·2 "	=	308 " "
Eosinophiles	...	...	0·4 "	=	56 " "
					14,000

Post-mortem Examination.—The dura mater showed large areas of hæmorrhagic mottling. The cerebellum was thickly studded with small petechiæ. Both retinæ were splashed with bright hæmorrhages, chiefly about the maculæ and discs. The tonsils were about the size of shelled walnuts, were pulpy, and showed a few petechiæ. The thymus was large and in places densely fibrotic, whilst here and there in the fibrous areas were patches of caseous material. In the less dense portions of the gland foci of hæmorrhage were seen. A slight hæmorrhagic effusion had taken place into each pleura, but there was no pleurisy. There were many petechiæ on the surface of the lungs and pericardium. The heart was mottled, especially on the anterior surfaces of the ventricles, by bright red hæmorrhages, covering large areas. The spleen was large and maroon-coloured, measuring about 6 in. by 4 in. It was soft and juicy, but not diffuent, and no structural change was detected. The liver was slightly enlarged but normal in appearance. The kidneys were slightly enlarged and pale grey in colour, the apices of the pyramids being particularly white. The cortex and medulla were poorly defined. In the former were several hæmorrhagic areas giving a bright red mottling to the otherwise grey substance; a few, however, were brownish green, probably from changes in the effused blood.

A few petechiæ were found in the stomach and peritoneum. Lymphatic glands on each side of the neck, a small bunch in each axilla, and a few retroperitoneal glands were found to be enlarged; the inguinal glands also were just palpable. The largest, which were found in the neck, did not exceed a shelled almond in size. All were discrete, soft and fleshy. The retroperitoneal chain were dark red in colour. The marrow in the femora was bright red and like red-currant jelly in appearance, and did not appear to be increased in amount.

Bacteriological examination of the heart's blood, spleen and marrow at the time of the autopsy yielded pure cultures of a short streptococcus.

Fermentation tests applied to the streptococcal growth yielded the following results: Saccharose, lactose, salicin, and raffinose were fermented; but mannite, coniferin and inulin were unchanged. Litmus milk became acidified and clotted. A guinea-pig was inoculated with an emulsion of the growth and died sixteen days after with a large abscess at the site of inoculation. On cultivation of its heart's blood a streptococcus was obtained which behaved in the same manner to the fermentation tests as the original growth.

Microscopical Appearances of the various Organs.—Lymphatic glands: Cervical, axillary and retroperitoneal glands, particularly the

last, showed marked increase in the number of lymphocytes, together with the presence of young germinal cells, and also considerable congestion. Tonsil was congested and the areas of lymphoid tissue were increased. Thymus showed extensive areas of hæmorrhage, and in several parts well-marked lymphocytic invasion; in the centre occurred a large necrotic area. Thyroid was scattered with a few foci of lymphocytes in the interstitial tissue. Heart: The muscle fibre showed no interstitial cell infiltration, but here and there occurred definite areas of hæmorrhage. Liver: Collections of lymphocytes were to be seen surrounding the portal canal areas, but there was little general cell invasion. The hepatic cells showed early fatty changes. Spleen: Much congested; the Malpighian bodies were increased in size and ill-defined on account of the accumulation of lymphoid cells around them. Kidney showed large areas of the lymphocytic invasion, particularly in the pyramidal portion, which was invaded to a greater extent than the cortex. The glomeruli and cortical blood-vessels were much engorged, and in places interstitial hæmorrhages had occurred. In many parts the cells of the cortical tubules were degenerated and their lumina plugged with cell debris. In the small intestine Peyer's patch showed thickening due to an increase in the formation of lymphocytes.

CASE VII.

Richard J., aged 1½, was admitted to the Hospital for Sick Children on February 16, 1906, under the care of Dr. Garrod, with a history of illness dating from the early part of January, 1906. He was said to have been feverish and to have vomited after his feeds of milk. There had been diarrhœa with green and offensive motions, which occasionally were reported to have contained blood. After a period of three weeks he had seemed better, but for a few days previous to his admission he became ill again, refused his food, and the motions again became offensive.

Up to the beginning of his illness the child had been breast fed, and subsequently fed on cow's milk. He had whooping-cough when aged 4 months. There was a family history of phthisis, both the maternal grandparents having died of it. He was the youngest of six, the rest of whom were healthy. On admission the patient appeared languid and ill; he was thin and very anæmic, the skin being of a lemon yellow tint and waxy-looking. The mucous membranes were very pale, and the body and limbs were scattered over with purpuric

spots. Temperature 100.5° F., respiration 48, pulse 156, soft and regular. There was slight general enlargement of the glands in the neck (especially the tonsillar gland), axillæ and groins, and also of the epitrochlear gland. They were all hard, discrete and freely movable. Scattered bronchitic sounds could be heard over both lungs and harsh vesicular breathing over the left lower lobe. The heart was acting tumultuously; a systolic bruit was audible at the apex, which was situated just outside the nipple line. The abdomen was distended. The liver extended two fingers' breadth below the right costal margin. The spleen was also enlarged and seemed tender on palpation. Its lower border could be felt 1 in. above the level of the umbilicus, and extended forwards to the left nipple line. A large rounded mass, thought to be kidney, was felt in each loin. The urine contained a cloud of albumin, but no blood. The temperature continued irregularly raised between 100.8° F. and 104° F. Death occurred suddenly on February 17 as the result of heart failure.

The blood was examined on February 15, 16 and 17, with the following results:—

	February 15	February 16	February 17
Hæmoglobin ...	35 per cent.	30 per cent.	—
Colour index ...	1.2	1.45	—
Red corpuscles ...	1,326,000	1,025,000	1,006,000 per cubic millimetre
Leucocytes ...	29,000	5,750	3,500 " "

DIFFERENTIAL COUNT.

	February 15	February 16
Polymorphonuclears ...	8.0 per cent. = 2,320	11.5 per cent. = 690 per cubic millimetre
Small lymphocytes ...	65.5 " }	70.0 " = 4,200 " "
Large lymphocytes ...	26.5 " } = 26,680	18.5 " = 1,110 " "

February 15.—Nucleated red cells: 4 normoblasts seen in counting 400 white blood-corpuscles.

February 16.—No nucleated red cells seen.

Red corpuscles showed poikilocytic and chromatophilic changes.

Post-mortem Examination.—The autopsy was made thirty-six hours after death. The body was that of a small, wasted child. The face and abdomen were scattered with petechiæ. There were no visible hæmorrhages from the lips, tongue, or gums. The brain and meninges appeared normal and there were no subdural hæmorrhages. The eyes showed no retinal hæmorrhages. The tonsils were not enlarged or hæmorrhagic; there were a few adenoids. The thyroid and thymus appeared normal. The lymphatic glands in the neck, axillæ and groin were slightly enlarged, soft, red and fleshy; those in the thorax and abdomen appeared normal. The lungs were dotted with a few subpleural hæmorrhages, but were in other respects normal. Heart: The visceral

layer of the pericardium was scattered with small hæmorrhages. The muscle was pale and the valves were healthy. The blood was very fluid and showed no signs of clotting. The liver was slightly enlarged, pale and mottled, and showed no hæmorrhages. The spleen was enlarged, reaching to 1 in. above the level of the umbilicus. It was uniformly swollen, red in colour and soft. There seemed to be no increase of fibrous tissue. The kidneys were both much enlarged, swollen and soft, bulging forward from the loins as two nearly ovoid masses, black in colour, due to large hæmorrhagic areas into the cortices. The capsules were stretched, but not adherent, and were dotted with a few capillary hæmorrhages. When stripped the organs were seen to be mottled over the surface by dark red and almost black areas of hæmorrhage with very little normal renal tissue showing between them. Here and there were brighter splashes of more recent blood-extravasations. The cortex was more involved than the medulla, but the normal definition between the two was lost, as there were several central hæmorrhages. In other respects the renal tissue, where visible, was of a pale grey colour, the apices of the pyramids being a creamy white, in marked contrast to the rest. The pelves, ureters and bladder were normal. The stomach and transverse colon showed a few submucous hæmorrhages, but the rest of the bowel looked healthy and contained no blood. Suprarenal and pancreas appeared normal. The marrow in the femur was bright red and drier than normal.

Bacteriological Examinations.—On the day before death the blood taken from the ear yielded on cultivation a pure growth of a short streptococcus. Spleen puncture made one hour after death also yielded a similar streptococcus in pure growth. At the time of the autopsy films taken from the heart's blood, femoral marrow, spleen, kidney and liver all showed the presence of a short streptococcus. These results were also verified by cultivation from the same parts, yielding in each case a pure growth of a similar streptococcus. Fermentation tests were applied and the following changes were observed within twenty-four to forty-eight hours; saccharose, lactose, salicin, and raffinose were fermented, but inulin, coniferin, and mannite were unaltered. Litmus milk was acidified and clotted. Inoculation of a subculture was made into a mouse, and death resulted in three days. A streptococcus was recovered in culture from the heart's blood of the mouse.

The microscopical appearances presented by the various organs were as follow :—

Lymphatic Glands.—The tonsil, cervical, mediastinal and retro-

peritoneal glands all showed congestion and considerable proliferation and accumulation of lymphocytes, in addition to areas of cell necrosis. The thyroid gland showed degenerative changes and collections of lymphocytes in the interstitial tissue. The thymus was crowded with lymphocytes; there was degeneration of the concentric corpuscles. The heart muscle showed no particular interstitial cell invasion, but the capillaries of the myocardium were congested. The kidney appeared to be completely destroyed by the occurrence of large hæmorrhages and an extraordinary accumulation of lymphocytes in the interstitial tissue, chiefly of the cortex. The gland tubules and glomeruli were widely separated from each other by this extensive cell invasion and remained only as straggling islands of renal tissue. In fact, the tissue might be briefly described as entirely composed of lymphocytes and hæmorrhagic areas, dotted here and there with the remains of gland tubules and glomeruli. The liver showed large collections of lymphocytes, especially about the portal canals, without any marked invasion of the capillary circulation. In places the liver cells at the periphery of the lobules showed fatty infiltration. The spleen was much engorged and the Malpighian bodies were increased in size by the accumulations of lymphocytes. The pancreas showed extensive invasion of the interstitial tissue by lymphocytes, which formed large cell masses in many places between the glandular acini. The suprarenal showed extensive cell necrosis. In the testicle the seminal tubules were widely separated by collections of lymphocytes, which invaded the interstitial tissue in all directions. The lymphoid tissue of Peyer's patch was much thickened by proliferation and accumulation of lymphocytes, and there was marked cell necrosis.

CASE VIII.

A boy, G. H., aged 2, attended the out-patient department at Paddington Green Children's Hospital on February 4, 1907. For a month the mother had noticed that he was getting pale and listless and disinclined to play. For a week the pallor had been intense and bruises had appeared all over his body, beginning on his knees. He had lost his appetite also and had occasionally vomited. He had not lost flesh, but had become very flabby. No change had been noticed in his urine.

At the hospital he was seen to be extremely anæmic, the face and skin generally being of a lemon tint. The muscles were soft and flabby; there were no buccal hæmorrhages, nor was there oral sepsis; there were numerous large and small hæmorrhages over the limbs and also on the

forehead; the lymphatic glands about the sterno-mastoid were slightly enlarged, the largest being little bigger than a pea; no other lymphatic glands could be felt; the liver reached two fingers' breadth below the costal margin; the spleen was large enough to be easily felt. The boy was very collapsed and died soon after admission to the hospital.

BLOOD-EXAMINATION.

Hæmoglobin ...	...	...	= 20 per cent.
Red corpuscles	...	...	= 1,200,000 per cubic millimetre.
Colour index ...	...	...	= 0·8
Leucocytes ...	...	...	= 196,840 per cubic millimetre.
Polymorphonuclears	...	...	= 0·2 per cent.
Large mononuclears	...	...	= 0·2 „
Small lymphocytes	...	...	= 84·5 „
Large lymphocytes	...	...	= 14·0 „
Basophiles ...	...	...	= 0·1 „

One normoblast was seen on counting 1,000 leucocytes.

Post-mortem Examination.—The body was that of a fairly well nourished child. The blood was watery but had clotted. The heart appeared normal except that its surface was mottled by bright red hæmorrhages of various sizes. The lungs showed many maroon-coloured hæmorrhages, both on the pleural surfaces and on section. The liver was pale, not appreciably enlarged, and contained no lymphoid patches. The spleen was enlarged and weighed 3 oz.; on its surface was a small patch of perisplenitis; its surface and a section were in some places maroon-coloured, in others dark cherry-coloured. The right kidney weighed just over 1 oz.; it was pale and its surface was spotted with petechial hæmorrhages; the apices of the pyramids were almost white, and the contrast between cortex and medulla was lost. The left kidney resembled the right, but contained also a deep-seated hæmorrhage. The suprarenal glands appeared normal; one small hæmorrhage was found in the intestine; the bone marrow was abundant and dark red in colour; the abdominal glands, especially those in the mesentery, were enlarged, pinkish and soft.

Histological Report by Dr. D'Este Emery.—“Liver: The most obvious feature in the liver is the presence in the region of the portal canals of large areas of lymphoid tissue, which almost completely separate the lobules from one another; in some places these areas are half as wide as the lobules themselves; they are very well seen just under the capsule of the organ, where the lobules are separated from one another in this

way, so that their structure and relations can be well seen. There is in general a fairly sharp line of demarcation between the lobules and lymphoid tissue, and the latter does not infiltrate to any great extent; there are, however, small detached portions lying inside many of the lobules, apparently being formed within small blood-vessels; here and there columns of liver cells and isolated cells can be seen within the lymphoid tissue, showing that it has in reality a very considerable amount of invasive power. The lymphoid tissue in question appears to be badly formed adenoid tissue, without germinal areas. The cells are mostly lymphocytes, but there are larger endothelial (?) cells also present. There is a badly formed fibrous reticulum. There is no blood mixed with the lymphocytes, and few, if any, blood-vessels can be seen. The liver cells in the outer zones of the lobules are apparently normal, whilst many of those in the centre show marked fatty infiltration and probably also degeneration. Kidney: The changes are limited to the cortex, the medulla being normal. The lesions are similar in nature to those seen in the liver, *i.e.*, there is a deposition of small areas of miniature lymphoid tissue, which are sufficiently large to be seen in this case with the naked eye. They lie between the tubules, which thus come to be dissected apart in much the same way as the lobules in the liver. The tubules and the glomeruli do not show much change, and are in general healthy, but here and there the remains of a tubule, which has been almost destroyed, can be seen amongst the lymphocytes. In many cases the lymphoid mass appears to have been developed in the walls of a vein or large lymphatic vessel, since in the centre of the area there is frequently a space lined with endothelium; in some cases there is some blood still present, but more often this lumen is empty. Occasionally the vessel may be seen cut longitudinally, the lymphoid investment then clothing it for its whole length. A study of the sections of the kidney renders it probable that all the lymphoid tissue is formed in the walls of the small veins, from which it infiltrates the surrounding tissues, and it seems likely that in those cases in which this vein seems lacking the section has missed it, cutting the lobule tangentially. This could only be settled definitely by a study of serial sections. It will be noticed that the lymphoid tissue resembles that of a lympho-sarcoma in two points: its immaturity and its infiltrating propensities. It differs from it, however, in that it does not seem to destroy the tissues it infiltrates. Liver cells, renal tubules, and arterioles may be seen embedded in the tissue, but intact. Lymphatic gland: In some parts, especially in the cortex, there is no obvious abnormality. In other parts it shows a breaking

up into alveolus-like areas of an excessive development of blood-vessels (most of which are empty in the section), an absence of germinal areas, an excessive number of lymphocytes, which are closely packed together, and here and there an unusual degree of vascularity of the tissue itself. At one point, at which there is a little adipose tissue, the lymphoid tissue has extended through the capsule and separates the fat cells, which remain intact. Spleen: No very definite changes can be made out, though the appearance of the section is unusual, owing to the excessive number of lymphocytes in the blood. Bone marrow: There are practically no cells other than lymphocytes to be seen, and an examination of measured films showed only lymphocytes with a very few eosinophile myelocytes, and still fewer ordinary myelocytes; no nucleated reds of any sort were to be seen. It was estimated that not more than one cell in 10,000 was other than a lymphocyte. The sections show lymphocytes mixed with blood and the usual scanty reticulum and sinuses. Adrenal: Apparently quite normal."

CASE IX.

A. B., male, aged 9, admitted to the Hospital for Sick Children, under the care of Dr. Voelcker, January 18, 1907. Died April 19, 1907. Duration, from onset to death, three to four months.

Nature of Onset.—One month previous to admission: pallor, loss of appetite, frequent headache. Since January 1: blood in urine; micturition not painful; nothing relevant in family or past history.

On Admission.—Temperature 99° F., pulse 78. Face pale, eyes normal in appearance. Mucous membranes pale, lips ulcerated, no bleeding from lips or gums. Teeth carious, tonsils enlarged and injected. Hæmorrhages: (1) Skin—Erythematous mottling on arms and legs, fainter over abdomen; subcutaneous hæmorrhagic bruising on left forearm and front of right leg on admission; (2) Gums—Later and persistent; (3) Hæmaturia on admission, disappearing later; (4) Retinal, right eye; later, April 5 and 13; (5) from bowel; later, April 12. Glands: Cervical enlarged on right side, February 26 and April 5. Thorax, lungs: Scattered bronchi at bases. Heart: Some dilatation. Abdomen: Nil abnormal found. Urine: Specific gravity 1016; blood; albumin $\frac{1}{5}$.

Microscopically.—Deposit of red blood-corpuscles, hyaline and granular casts, renal epithelium.

Subsequent Course.—Persistent bleeding from gums. Urine became normal, with the disappearance of blood, albumin and casts.

BLOOD-EXAMINATIONS FROM APRIL 9 TO 17.

	April 9	April 12	April 15	April 16	April 17
Hæmoglobin ...	40 per cent.	25 per cent.	25 per cent.	20 per cent.	—
Colour index ...	1·8	1·6	1·7	1·6	—
Red corpuscles ...	1,086,000	754,000	730,000	647,000	528,000
Leucocytes ...	113,000	37,500	32,750	18,000	15,000

DIFFERENTIAL COUNT.

	April 9	April 12	April 15	April 16
Polymorphonuclears ...	2·2 per cent.	11·4 per cent.	14·0 per cent.	16·7 per cent.
Large mononuclears ...	0·2 „	1·0 „	—	—
Small lymphocytes ...	2·6 „	19·0 „	27·75 per cent.	24·6 per cent.
Large lymphocytes ...	95·0 „	67·0 „	58·0 „	58·4 „
Myelocytes ...	—	1·6 „	0·25 „	0·3 „
Nucleated red cells ...	1 normoblast	1 normoblast	1 normoblast	1 normoblast

Post-mortem (six hours after death).—Brain: No hæmorrhages, slight œdema of vertex. Mouth: Tonsils enlarged and fleshy; on section, yellow in colour with blanching of deeper portion; small amount of hæmorrhage over the pharynx. Glands: Cervical slightly enlarged, injected and pale; thoracic, mediastinal, bronchial, not enlarged; mesenteric and retroperitoneal slightly enlarged and pink, a few almost black from hæmorrhage. Thorax: Lungs and pleuræ, normal. Heart: Pericardium, normal; cardiac muscle very pale and soft, fatty striation marked; many small epicardial hæmorrhages. Liver: Enlarged and pale fawn colour; pronounced fatty changes and some congestion were present. Spleen: Not enlarged, normal in appearance. Pancreas large; parenchyma scattered with hæmorrhages. Suprarenals normal. Kidneys somewhat enlarged and intensely pale; left showed many small hæmorrhages and congested venules on the surface; right, fewer hæmorrhages. Ureters and bladder normal; pale mucosa. Stomach and intestines showed no ulceration or marked congestion; contained much altered blood.

Bacteriological and Histological Report.—The heart's blood and spleen proved sterile. Tonsil: The follicles were well filled with lymphocytes, many of which were necrotic. Thymus: Some areas of necrosis; the concentric corpuscles varied much in size, and in places had disappeared or undergone calcareous degeneration. No great increase in lymphoid tissue was present. Glands (cervical, bronchial and mesenteric): Cortical portions crowded with lymphocytes; follicular divisions obscured. Retroperitoneal: Lymphoid follicles well defined and crowded with lymphocytes, many of which showed necrotic changes; pigment deposit in medulla of gland. Heart muscle showed marked fatty degeneration, but no obvious cell invasion. Liver showed everywhere

extreme fatty changes of the cells, very little normal tissue remained. Here and there were small collections of lymphocytes. Kidney: In a few places only the interstitial tissue showed slight invasion with lymphoid cells, which were found also around the glomeruli. Here and there were seen cloudy swelling and fatty degeneration of the cells of the cortical tubules, whose lumina were filled with cell debris. There was no definite evidence of nephritis. Spleen: Capsule and trabeculae thickened. The organ was somewhat congested and densely crowded with lymphocytes; the Malpighian corpuscles were well marked; the pulp showed much pigmentary deposit.

CASE X.

D. P., female, aged 3 years and 7 months, was admitted to the Hospital for Sick Children, under Dr. Batten, on June 5, 1907, and died June 7, 1907. Duration, from onset to death, ten days (?).

Nature of Onset.—Pallor had been increasing for six months, but she had been able to run about till a week before admission.

Family History.—She was one of two children; the other had died six months before from diphtheria.

The family occupied damp rooms on the ground-floor.

On admission she was seen to have an intensely waxy colour, and was fretful and wailing. Temperature 100° F., pulse 136, respiration 52. No hæmorrhages were present; nothing abnormal was found in either thorax or abdomen.

June 6, very restless; June 7, sudden collapse and death.

BLOOD-EXAMINATION.

Red corpuscles	...	...	—	255,000	per cubic millimetre.
Leucocytes	...	..	—	7,500	„ „

DIFFERENTIAL COUNT.

Polymorphonuclears	...	...	...	=	3·0 per cent.
Small lymphocytes	...	...	...	=	91·0 „
Large lymphocytes	...	...	...	=	5·5 „
Eosinophiles	...	...	...	=	0·5 „

A limited autopsy was performed twelve hours after death.

Bacteriological Examination.—Culture from the heart's blood yielded a short streptococcus in pure growth.

Fermentation Tests.—Saccharose, lactose and raffinose were fermented, but mannite and salicin were not. Litmus milk was clotted and acidified. Spleen, sterile.

Post-mortem Examination.—Spleen was large and weighed $2\frac{1}{2}$ oz. Liver very pale. Kidneys: Right weighed 2 oz. $2\frac{3}{4}$ drn.; they were enlarged and very pale, but otherwise did not appear abnormal; free iron was present. Intestines: Rectum contained very black fæces, probably due to medicinal iron staining. No ulceration was found in the stomach or any part of the alimentary canal. Peyer's patches were prominent. The mesenteric glands were somewhat enlarged.

Microscopical Appearances.—Mesenteric gland: There was general hyperplasia of lymph cells, especially in the cortex and invading the capsule. Kidney: Congestion of the cortex and cloudy swelling of the cells of the cortical tubules were present. A few groups of lymphocytes appeared in the interstitial tissue and more dense collections along the margin of the calyx. Liver: Cells showed fatty changes and cloudy swelling. There were evident collections of lymphocytes about the portal canals and under the capsule. Spleen: General increase of lymph cells throughout, especially of the large lymphocytic form. They were chiefly grouped beneath the capsule. Small intestine: Peyer's patch showed hyperplasia of lymph cells, which also invaded the intestinal glands draining the patch.

CASE XI.

G. D., female, aged 1, admitted on July 12, 1907, into the Hospital for Sick Children, under the care of Dr. Colman. Died August 18, 1907. Duration, from onset to death, six weeks.

Nature of Onset.—The child had been noticed to be ailing for three months. Pallor, restlessness and wasting had been present for one week.

On admission the patient was extremely pale and of a lemon yellow tint, but well nourished. Pulse, 152; respirations, 40; temperature, raised. Purpuric spots were present on the forehead, arms and legs. No enlargement of glands was discernible. The heart was not dilated; a hæmic systolic murmur was audible at the apex; no abnormal signs were detected in the lungs. The spleen was enlarged, reaching three fingers' breadth below the costal margin, and the edge of the liver could be felt extending downwards for the same distance.

Subsequent Course.—July 22: Purpura has disappeared; occasional vomiting; the temperature is sometimes raised. July 26: Spleen somewhat smaller; the patient shows a gain in weight of $\frac{1}{4}$ lb. July 31: Discharged.

She had been treated by the administration of liq. arsenicalis $\mathfrak{m}\mathfrak{j}$. to $\mathfrak{m}\mathfrak{i}\mathfrak{j}$. every six hours.

On August 11 vomiting occurred. August 15, convulsion lasting some hours. On August 16 patient was readmitted. The skin was of a lemon yellow tint and blue around the eyes and mouth; the lips were cyanosed; purpuric spots were present on the face. The temperature was 102·6° F., pulse 176, respirations 72. She seemed better on the day after admission. The temperature fell to 99° F., but rose again to 103° F. Death occurred on August 18.

BLOOD-EXAMINATIONS.

			July 12		July 23		August 18
Hæmoglobin	...	...	27 per cent.	...	32 per cent.	...	30 per cent.
Colour index	...	...	1·2	...	1·3	...	1·4
Red corpuscles	...	...	1,046,000	...	1,198,000	...	1,023,000
Leucocytes	...	...	60,000	...	31,500	...	14,000

DIFFERENTIAL COUNT.

Polymorphonuclears	...	4·75 per cent.	...	3·5 per cent.	...	11·3 per cent.
Large mononuclears	...	0·5 "	...	0·5 "	...	0·3 "
Small lymphocytes	61·5	93·5 "	61·0	91·0 "	67·7	87·7 "
Large lymphocytes	32·0		30·0		20·0	
Eosinophiles	...	0·5 "	...	2·0 "	...	—
Myelocytes	...	0·75 "	...	2·0 "	...	0·66 "
NUCLEATED RED CELLS	...	2 normoblasts	Basophile 1, 5 normoblasts, poikilocytes, and chromatophilic changes			2 normoblasts and marked poikilocytosis

Post-mortem Examination.—No bacteriological examination was made. The body was that of a small, wasted infant; dark red purpuric spots could be seen on the face. Brain: No abnormality. Lymphatic glands: A few slightly enlarged glands, pale pink on section, were found in the neck and axillæ; the mesenteric glands were normal. Thorax: Heart—Petechial hæmorrhages were seen on the anterior surface of the right ventricle, and to a less degree of the left. Lungs—Broncho-pneumonic consolidation at the left apex. Abdomen: Liver—Fatty, not enlarged. Spleen—Not obviously enlarged, rather hard. Kidney—Pale, slightly fatty. Stomach—Slight hæmorrhage into submucosa. Intestines—*Nil*. Marrow: Bright red in colour.

Microscopical Changes.—Kidney: Cloudy swelling of the cells of the cortical tubules and lymphocytic invasion and hæmorrhages of the interstitial tissue between the tubules. Liver: Fatty and cloudy degeneration of the liver cells; collections of lymphocytes invaded the connective tissue of the portal canals. Spleen: Congested; increase of fibrous tissue and consequent thickness of the trabeculæ, hyperplasia of

lymphocytes surrounding the Malpighian corpuscles. Mesenteric gland: Definition between medulla and cortex lost by the hyperplasia of lymph cells.

CASE XII.

B. W., female, aged 7 months, admitted into the Hospital for Sick Children, under Dr. Colman, on December 23, 1907. Died December 25. Duration, from onset to death, one week (?).

Nature of Onset.—Pale since birth; wasting; vomiting and some diarrhoea had occurred during the week before admission. Enlargement of the cervical glands was noticed on December 21. There was nothing of importance in the family history. *On admission* she was seen to be very anæmic but well nourished. The temperature was irregular, ranging between 100° F. and 102° F.; pulse, 164; respirations, 48. No teeth had been cut. Numerous petechial hæmorrhages were seen scattered over the face, trunk and limbs. Some on the front of the tibiæ were 1 in. in diameter. No enlargement of glands was noticed. No oral sepsis or buccal hæmorrhages were found. No abnormality was noticed in heart or lungs. The abdomen was somewhat distended. The liver was slightly enlarged. The spleen was hard and enlarged, reaching two fingers' breadth below the costal margin. There was tenderness on palpation in the right renal region, and both kidneys were felt. The urine was acid and gave a slight precipitate of albumin on boiling; it contained no blood.

BLOOD-EXAMINATION.

Hæmoglobin ...	...	...	= 65 per cent.
Red corpuscles	...	...	= 2,006,000 per cubic millimetre.
Leucocytes	...	...	= 321,000 ,, ,,

DIFFERENTIAL COUNT.

Polymorphonuclears	...	...	= 0·9 per cent.
Small lymphocytes	...	...	= 33·4 ,,
Large lymphocytes	...	...	= 65·7 ,,
			} 99·1 per cent.

Post Mortem.—The body was that of a very pale, fat infant. Purpuric spots were found all over, especially on the front of the tibiæ. Brain and membranes normal. Lymphatic glands: The submaxillary pre-auricular, inguinal and axillary glands were much enlarged and pale on section, but the bronchial and mesenteric glands were not affected. Lungs: Some hæmorrhages in the lung tissue resembled infarcts, others were subpleural. Heart muscle was very pale, except for numerous

epicardial petechiæ. Abdomen: The liver weighed $15\frac{1}{2}$ oz., and was pale yellow and soft, both superficially and on section; no nodules were seen in it. Spleen: Enlarged and hard, weight 2 oz. and 1 dr. m.; Malpighian areas enlarged and grey in colour. Kidneys: Right weighed 5 oz. 6 dr. m.; left weighed 5 oz. 5 dr. m.; both very enlarged and lobulated, and of a pale cream colour, spotted with many small hæmorrhages. Stomach normal. Intestine normal, except that Peyer's patches were enlarged and prominent. Cultivations taken from the heart's blood and enlarged cervical gland yielded a mixed growth of cocci and bacilli, evidently contaminations, since the spleen, kidney and liver proved sterile. Films from the bone marrow showed the cells to be nearly all large lymphocytes, and the same condition was found in films from the kidney, liver, spleen and subcutaneous hæmorrhage. No organisms were seen.

Histological Changes.—The skin over the tibia (site of large petechial hæmorrhage) showed a mass of lymphocytes and red blood-corpuscles situated in the subcutaneous tissue. No evidence of organization could be seen in the patch. Cervical gland: The cortex and medulla were crowded with masses of lymphocytes, which obscured the normal appearance of the gland. The connective tissue and capsule of the gland were equally invaded by lymphocytes. Lung: The alveolar walls were much swollen by the presence of lymphocytes in the capillaries. Many of the alveoli contained loose lymphocytes and endothelial cells. The pleura was thickened by subpleural hæmorrhage and lymphocytic deposit. Heart: Right ventricle—Section through the site of a petechial hæmorrhage showed a collection of red blood-corpuscles and lymphocytes under the epicardium extending between the muscle fibres and also on the endocardial surface in the recesses between the columnæ carneæ. Left ventricle showed marked interstitial invasion by lymphocytes. Liver: The portal canals were densely crowded by lymphocytes, which were also grouped under the capsule; the liver cells show cloudy swelling and fatty changes. Kidney: Almost completely replaced by lymphocytes, only scattered islets of glomeruli and glandular tubules remaining; the capsule of the kidney was also increased in thickness by the accumulation of lymphocytes. Small intestine: A Peyer's patch was swollen and crowded with lymphocytes, which infiltrated and distended the neighbouring villi and submucous tissue. Spleen: Packed with lymphocytes, which were chiefly found round the Malpighian corpuscles and formed a sheath enclosing the blood-vessels, without invading the vessel walls or occupying the vascular channels.

SYNOPSIS OF TWELVE CASES.

Age ranged from 7 months to 11 years—five cases of 2 years and under, five cases of 4 years and under, one case aged 9 years, and one case aged 11 years.

Sex.—Six male and six female.

Duration: I.—From onset of first symptoms to death, one week to seven months: In two cases under two weeks, in seven cases under six weeks, in one case ten weeks (average five to six weeks), in one case three to four months, and in one case about seven months. II.—From onset of acute symptoms: In four cases one week, in one case three weeks, in four cases six weeks, in one case eight weeks, in one case three months, and in one case five months. III.—Duration in hospital: In five cases under three days, in one case five days, in two cases five weeks, in two cases eight weeks, and in two cases thirteen weeks.

Nature of Onset.—Increasing pallor and languor; hæmorrhages, chiefly in the form of purpuric rash over face, trunk and limbs; also bleeding from gums, epistaxis, hæmatemesis (rarely), intestinal hæmorrhage and melæna, hæmaturia (rarely), occasionally vomiting and diarrhœa.

Clinical Features.

(A) *Tendency to Hæmorrhages*.—(1) Purpuric and petechial: In nine cases general distribution in greater or less degree over face, trunk and limbs. (2) (i.) Retinal: In four cases in one or both eyes; (ii.) Conjunctival in one case. (3) Epistaxis: In three cases during the course of the disease. (4) Buccal: In three cases severe hæmorrhage from gums associated with carious teeth; in two cases on lips, palate and cheeks. (5) Intestinal: In five cases there was hæmorrhage from the bowel or melæna; in one case there was a history of hæmatemesis and melæna two weeks before admission. (6) Renal: In one case the early course was marked by hæmaturia, which disappeared two months before death.

(B) *Glandular Enlargement*.—In five cases there was slight enlargement of the cervical, axillary and inguinal glands; in four cases slight enlargement of the cervical glands only was recorded. In three cases there was no evidence of glandular enlargement.

(C) *Enlargement of Liver*.—In ten cases the liver was felt to be enlarged, extending in seven to two fingers' breadth below the costal margin and in three to the level of the umbilicus. In two cases the liver could not be felt.

(D) *Enlargement of Spleen.*—In ten cases the spleen was enlarged, in four reaching to the level of the umbilicus, and in six two or three fingers' breadth below the costal margin; but in two cases it was not palpable.

(E) *Kidneys.*—In three cases both kidneys could be felt as large rounded masses; in the remaining nine they could not be felt or palpation was not recorded.

(F) *Urine.*—Blood was present in one case only; in two cases casts were found. In five cases albumin was detected in slight traces, but in the case of hæmaturia to the amount of one-fifth. In the remaining six the albumin was absent or not recorded.

(G) *Gastro-intestinal Symptoms.*—Vomiting occurred in the early course of five cases, more rarely shortly before death. It was associated with a history of hæmatemesis in one case and with diarrhœa in two cases. Unaltered blood was present in the stools in four cases, but only in one in serious amount, while in two cases there was melæna.

(H) *Temperature.*—In every case the temperature ran an irregular course with rises to 102° F., 103° F., or 104° F., but during temporary improvement fell to normal in three prolonged cases.

Blood-Condition.

In every case there was marked anæmia, the skin being of a waxy pallor or lemon yellow tint; the mucous membranes were correspondingly pale, especially in the later course.

The Red Corpuscles.—In seven cases the red blood-corpuscles numbered under 1,500,000 per cubic centimetre and in one case fell as low as 528,000 per cubic centimetre before death. In three cases the earlier counts varied between 3,000,000 and 2,000,000, and in three the count was not recorded. The percentage of hæmoglobin ranged between 65 per cent. and 15 per cent., but not in direct proportion to the number of red cells, so that the colour index showed considerable variation in the series of cases. In four cases it lay between 0·87 and 0·54, and in five cases it was over 1. In a few cases there was a slight amount of poikilocytic and chromatophilic change to be noted, and in five cases a very few nucleated red cells were observed. In six cases, under observation for a period of four to six weeks, a steady fall was traced in the number of red corpuscles per cubic millimetre during the later stages; in one from 2,500,000 to 1,106,000, in another from 3,700,000 to 1,424,000, and in a third severe case from 1,310,000 to 528,000.

The Leucocytes.—The majority of cases showed an increase in the number of leucocytes at some period, but the figure varied very considerably in the different cases, and during the course of the individual cases; the highest count was 1,000,000 per cubic millimetre, subsequently dropping to 500,000. Others gave the following counts: (1) 321,000; (2) 196,800 on the day of death (the only examination possible); (3) 126,000, falling steadily in the course of three weeks to 15,000 before death; (4) 60,000, falling in five weeks to 14,000; (5) 29,000, falling in three days to 3,500 per cubic millimetre. In two cases an

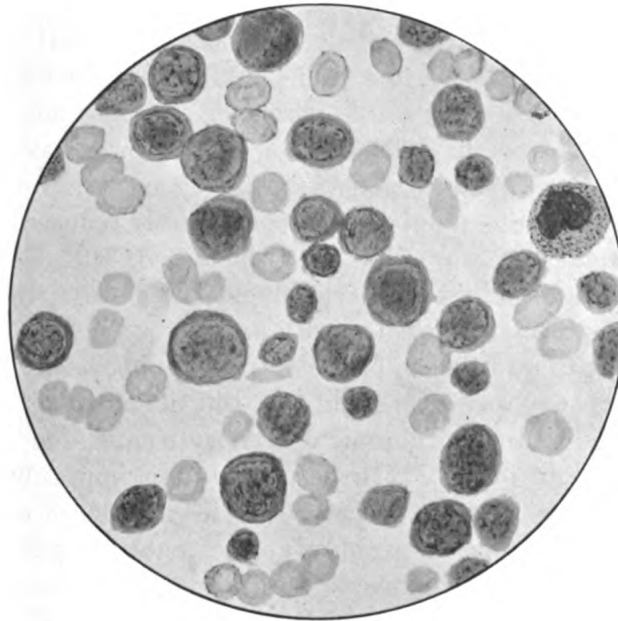


FIG. 1.

Blood-film. B.W., aged 7 months. Leucocytes, 321,000 per cubic millimetre.

Large lymphocytes, 65·7 per cent.	} 99·1 per cent.
Small lymphocytes, 33·4 „	

(E.P. 8. Objective $\frac{1}{10}$, oil immersion.)

increase in the number of leucocytes developed while the patients were under observation in hospital: (1) D.R. (Case IV.), on August 1, 1904, leucocytes, 5,000; August 11, 40,000; August 29, 61,000; September 14 (two days before death), 14,000 per cubic millimetre; (2) A.H. (Case V.), November 8, 1904, leucocytes, 3,000; December 1, 20,000; December 8, 83,000 per cubic millimetre. In two cases the only examinations made

were on the day of death; they showed counts of 14,000 and 7,500 per cubic millimetre. From these results it would appear that in the severe and acute forms of the disease the number of leucocytes is greatly increased, as in the two cases with counts of 196,800 and 321,000 per cubic millimetre on the day of death; but in other cases, whose course is less rapid, the number of leucocytes is considerably lower, and may show a still further decrease in the later stages, and even result in a leucopenia shortly before death.

Differential Count of Leucocytes.—On the differential count rests the diagnosis of true cases of lymphocythæmia. All of the ten cases examined exhibited either an absolute or relative increase in the number of lymphocytes, ranging from 66 per cent. (at the onset) to as high as 99 per cent. of all the leucocytes. The total figure per cubic millimetre was found to vary according to the period of the case and its severity; thus, towards the end the lymphocytes showed proportionately to the other leucocytes a greater relative excess than at an earlier period, although their absolute number was considerably reduced. Both small and large lymphocytes were in all cases increased, but not in the constant proportions described in previously recorded cases, in which acute forms of the disease are associated with an increase of the large, and the more chronic with an increase of the small, lymphocytes.

This discrepancy seems to be due to the difficulty in defining precisely the terms acute and chronic lymphocythæmia, and in fixing the date of the onset of illness. Further, it is often impossible to draw a hard and fast line between what constitutes the large and the small lymphocyte. For purposes of only approximate distinction the terms here used for the large lymphocyte include any lymphocyte measuring $10\ \mu$ to $15\ \mu$ or over, and, for the small, any lymphocyte with a diameter of $5\ \mu$ to $10\ \mu$. Many cases show every gradation in size of the lymphocyte from $5\ \mu$ to $15\ \mu$, and therefore an accurate separation of the two types becomes an impossibility.

Ten of the twelve cases were aged under 4; for this reason the condition of the blood, especially the proportions of lymphocytes, cannot be properly compared with the changes recorded in adult cases of lymphocythæmia. Taking the twelve cases in order of duration, the leucocyte counts mentioned on the following page were obtained.

These results seem to show that in the more acute cases, when the lymphocyte count is highest, there is a greater numerical increase, both relatively and absolutely, of the large lymphocytes than of the small, and at this time death may occur, as in cases A. H. and B. W. In the

more prolonged cases, as this period is passed, there is a marked decline in the total number of lymphocytes, affecting the small lymphocytes relatively less than the large; and, as has been pointed out, the fall may be so considerable as to result in a leucopenia immediately pre-

	Age	Duration	Leucocytes		Small Lymphocytes		Large Lymphocytes	
				Per c.mm.	Per cent.	Per c.mm.	Per cent.	Per c.mm.
(1) D. R.	4 years	7 months	(Aug. 1)	5,000	44.0 =	2,200	22.0 =	1,100
			(Aug. 11)	40,000	45.0 =	18,000	16.5 =	6,600
			(Aug. 29)	61,000	50.6 =	30,866	49.0 =	29,890
			(Sept. 14)	14,000	50.6 =	7,084	46.6 =	6,524
			(two days before death)					
(2) A. B.	9 years	3 to 4 months	(Mar. 27)	126,000	9.8 =	12,348	87.8 =	110,628
			(April 9)	113,000	2.6 =	2,938	95.0 =	107,350
			(April 12)	37,500	19.0 =	7,125	67.0 =	25,125
			(April 15)	32,750	27.75 =	9,077	58.0 =	18,995
			(April 16)	18,000	24.6 =	4,428	58.4 =	10,512
			(April 17)	15,000	—	—	—	—
			(day before death)					
(3) W. J.	2½ years	10 weeks	(April 18)	1,000,000	56.0 =	560,000	41.7 =	417,000
			(May 3)	272,000	—	—	—	—
			(May 23)	622,000	—	—	—	—
			(May 31)	500,000	—	—	—	—
			(Day before death)					
(4) H. S.	3 years	8 weeks		14,000	94.0 =	13,160	2.2 =	308
(5) G. D.	1 year	6 weeks	(July 12)	60,000	61.5 =	36,900	32.0 =	19,200
			(July 25)	31,500	61.0 =	19,215	30.0 =	9,450
			(Aug. 18)	14,000	67.0 =	9,380	20.0 =	2,800
(6) A. H.	1½ years	5 to 6 weeks	(Nov. 8)	3,000	—	—	—	—
			(Dec. 1)	20,000	60.6 =	12,120	16.4 =	3,280
			(Dec. 8)	81,000	50.6 =	40,986	45.7 =	37,017
			(day before death)					
(7) R. J.	15 months	5 to 6 weeks	(Feb. 15)	29,000	65.5 =	18,995	26.5 =	7,685
			(Feb. 16)	5,750	70.0 =	4,025	18.5 =	1,064
			(Feb. 17)	3,500	—	—	—	—
			(Day of death)					
(8) G. H.	2 years	1 month		196,800	84.5 =	166,296	14.0 =	27,552
			(Day of death)					
(9) D. P.	3 yrs. 7 mon.	10 days		7,500	91.0 =	6,825	5.5 =	500
			(Day of death)					
(10) B. W.	7 months	1 week		321,000	33.4 =	107,214	65.7 =	210,897
			(Day of death)					

ceding death. This ante-mortem fall in the number of lymphocytes holds good for the majority of cases, and explains the low count obtained in those which prove fatal shortly after admission.

The explanation of the occurrence of a true lymphocythæmia is

necessarily a matter for surmise, when the rôle of the lymphocyte, particularly in infancy and childhood, still remains unknown.

It may be suggested that in response to the influence of a microbic infection or toxæmia, the lymphocyte plays an important part in the defensive mechanism of early life, and invades the circulation in sufficient numbers to produce a lymphocythæmia of varying degree. In those cases terminating acutely, with a high lymphocyte count of 100,000 to 300,000 per cubic millimetre, the infection may have been so intense as to prove fatal, in spite of the opposing reaction.

In other cases of longer duration a response is made, but proves inadequate to deal with the infection; consequently the lymphocyte is thrown out of the circulation, either from the failure of sufficient stimulins or antibodies to maintain the lymphocytic reaction or from the direct action of the infecting organism or poison. The accumulation of lymphocytes in all parts of the body, except the blood-stream, almost invariably found in these cases post mortem, seems to lend support to this attempted explanation.

If, on the other hand, the lymphocyte is functionless and plays no part as a protective agent, its over-production may be due to a passive hyperplasia of the lymphoid cells of the marrow and adenoid tissues, which in early life are the seat of constant change and therefore particularly liable to yield to infective processes. As a result of this over-production collections of lymphocytes make their appearance in parts of the body where adenoid tissue is not normally present.

The other leucocytes call for but little remark. Polymorphonuclears show an absolute decrease. Eosinophiles are much reduced or absent, more particularly during the later stages. Myelocytes may occur in low numbers in a very few cases. The prevailing feature of a lymphocythæmia which characterizes these blood-changes, if due to an acute microbic infection, may be compared with the relative lymphocytosis which marks the course of infections of longer duration, such as typhoid fever, malaria, syphilis and tuberculosis.

SUMMARY OF POST-MORTEM EXAMINATIONS OF TWELVE CASES.

The brain and meninges, as a rule, showed no changes, but in one case (H. S.) large subdural hæmorrhages were found scattered over the cerebrum, and numerous petechiæ studded the surface of the cerebellum.

The tonsils were occasionally enlarged, red and fleshy, and in some cases showed either deep-seated or superficial hæmorrhages. The micro-

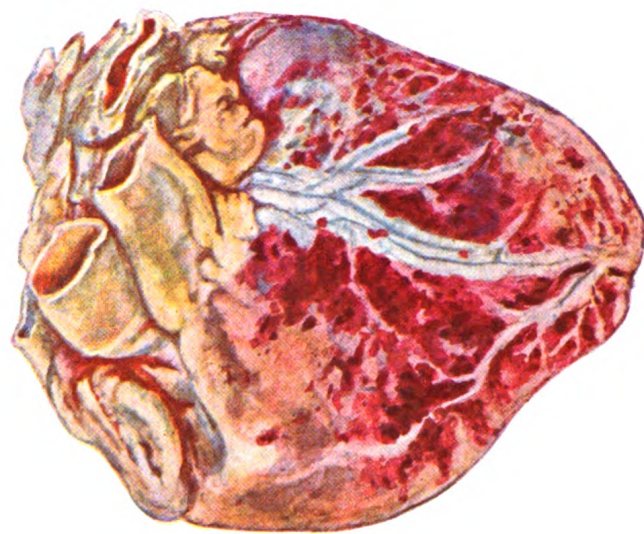


W. H. W., del.

FIG. 1.

Left Kidney (natural size). Weight, 7 ozs. 1 drin. Measurements,
 4½ in. by 2½ in. D. R., aged 4 years.

FORBES & LANGMEAD: *Fatal Lympho-phleoma in early life.* Plate I.



W. H. W., del.

FIG. 2.

Heart (natural size). Anterior surface. Extensive epicardial
 hemorrhage. H. S., aged 3 years.

scopical changes showed proliferation of lymphocytes with central areas of necrosis or hæmorrhage.

The thymus in only one case was found definitely enlarged, and in three cases was microscopically examined. There was found proliferation of lymphocytes, hæmorrhages and necrotic foci, and lymphocytic invasion of the connective tissue. The thyroid appeared normal to the naked eye. One case showed, histologically, degenerative changes of the glandular acini and collections of lymphocytes in the connective tissue.

Lymphatic Glands.

(1) Cervical : In seven cases there was definite or slight enlargement.

(2) Axillary : In four cases there was slight enlargement.

(3) Mediastinal : In two cases there was slight enlargement.

(4) Abdominal : (i.) Glands about the portal fissure were considerably enlarged in two cases. (ii.) Mesenteric : there was definite or slight enlargement in six cases. (iii.) Retroperitoneal : there was definite or slight enlargement in five cases.

(5) Inguinal : In three cases slight enlargement was found.

Macroscopically the lymphatic glands were sometimes merely pale, but more often fleshy, soft and red, and, particularly in the case of the mesenteric and retroperitoneal glands, dark hæmorrhagic discoloration was not uncommonly found. The glandular enlargement was seldom really marked or of universal distribution, affording a striking contrast to their condition in chronic lymphocythæmia. Histologically the more enlarged glands showed considerable hyperplasia of lymphocytes, affecting the cortical portions more than the medulla, and frequently invading the capsule and pericapsular fat. The medulla was usually congested and sometimes showed hæmorrhages, especially in the case of the retroperitoneal glands. This hæmorrhagic condition was found less often in the cortex. The lymphocytic proliferation was in several cases so abundant as to overrun and obliterate the follicular division of the cortex. Germinal cell areas were absent or much diminished.

The Heart and Pericardium.—The pericardial sac contained no excess of fluid. The visceral and particularly the parietal layers were studded with fine petechiæ or covered with extensive hæmorrhagic areas. The heart was frequently dilated. The cardiac muscle was pale, but presented no fatty striation; the endocardium in some cases showed scattered hæmorrhagic points. The valves showed no changes microscopically; the muscle fibres sometimes showed slight fatty degeneration

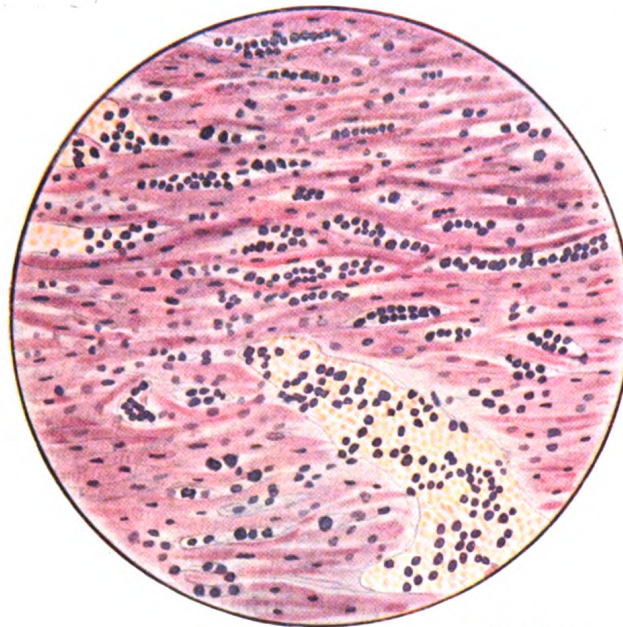
and invasion of the interstitial tissue by lymphocytes, which were arranged in rows between the fibres. The hæmorrhagic foci were composed of red corpuscles and lymphocytes underlying the endocardium or visceral pericardium and extending into the muscle substance. The heart's blood showed delayed coagulation, and in every case at the time of the post-mortem examination the heart cavities contained fluid blood, with no attempt at clotting. It was usually pale red, thin and watery, in contrast to the yellow colour shown by cases of chronic lymphatic leukæmia.

The Lungs and Pleuræ.—The pleural cavities in some cases contained a small quantity of blood-stained fluid, and the parietal and visceral layers were frequently scattered with small hæmorrhages. Pleural adhesions were occasionally found. The lungs were occasionally œdematous, and showed, in addition to subpleural petechiæ, deeper-seated hæmorrhagic areas and broncho-pneumonia.

The *liver* was almost invariably enlarged. In one case (W. J.), aged $2\frac{1}{2}$ years, it weighed $27\frac{1}{2}$ oz. Its substance was firm and its colour varied from very pale to light yellow, or was mottled with small white or faint grey patches. Microscopically the following changes were observed: The liver cells usually showed marked fatty infiltration, in the majority of cases not universal, but limited to the periphery of the lobules; there was also cloudy swelling. In one case (A. B.) the fatty changes were extreme, and there was but little normal liver tissue remaining. In all cases collections of the lymphocytes were found underlying the capsule and closely investing the portal canals. Where a blood-vessel appeared in longitudinal section the lymphocytes were found thickly arranged on each side, although the channel itself showed but few cells. The interlobular capillaries contained lymphocytes, but were never crowded. The connective tissue enclosing the portal canals was the invariable seat of lymphocytic invasion.

The *spleen* usually showed a variable amount of enlargement. Its weight was 2 oz. to 3 oz. in three cases, aged 7 months, 2 years and $3\frac{1}{2}$ years (the duration of whose illnesses was one week, one month, and ten days respectively); 7 oz. and 10 oz. in two cases, aged 3 and 2 respectively (the duration of whose illnesses was ten weeks and five weeks); and $5\frac{3}{4}$ oz. in a case aged 11, whose illness lasted five weeks. The enlargement was therefore subject to considerable variation, but more marked in cases under the age of 3.

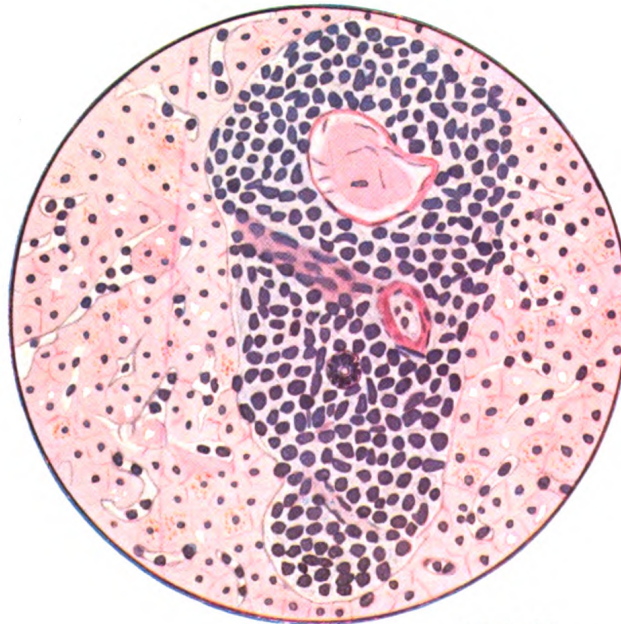
It was generally firm in substance, dark red in colour, with greyish definition of the Malpighian areas. Microscopically the capsule was



J. G. F., del.

FIG. 1.

Cardiac Muscle. Left ventricle. B. W., aged 7 months. Interstitial lymphocytic invasion and area of hæmorrhage.
(E. P. 3. Obj. 3, Leitz.)



J. G. F., del.

FIG. 2.

Liver. B. W., aged 7 months. Lymphocytic invasion of portal canal.
(E. P. 8. Obj. 3, Leitz.)

1

usually seen to be thickened, the pulp much congested and crowded with lymphocytes; but the lymphocytes were more obvious around the Malpighian bodies and invested the blood-vessels in the form of a sheath.

The kidneys presented very striking changes, which may be considered more characteristic of fatal lymphocythæmia than those in any other organ. Though only occasionally palpable during life, the enlargement found post mortem was remarkable, but differed considerably in the series of cases, as shown in the following table:—

Age				Weight of Kidneys
B. W.	...	7 months	...	Right, 5 oz. 6 drms.; left, 5 oz. 5 drms.
G. D.	...	1 year	...	No increase in size recorded.
R. J.	...	15 months	...	Both much enlarged.
A. H.	...	1½ years	...	Right, 1½ oz.; left, 1½ oz.
G. H.	...	2 years	...	„ 1 oz.; „ 1 oz.
W. J.	...	2½ years	...	Both much enlarged.
H. S.	...	3 years	...	Both enlarged.
E. M. H.	...	3 years 3 months	...	Right, 6½ oz.; left, 7½ oz.
D. P.	...	3 years 7 months	...	Right, 2½ oz.
D. R.	...	4 years	...	Right, 5½ oz.; left, 7 oz.
A. B.	...	9 years	...	Enlarged.
D. B.	...	11 years	...	Right, 4½ oz.; left, 4½ oz.
Normal adult	...	...	...	4 oz. to 6 oz. each.

The surface of the kidney was often lobulated and of a pale yellow colour, mottled with dark areas of hæmorrhage; occasionally the hæmorrhagic condition was so extreme as to cause a general dark red, almost black, discoloration. On section the cortex was of a pale creamy colour, scattered with hæmorrhagic points or extensive mottling which prevented the definition of the medulla. The pyramids showed marked contrast by their pronounced pallor. In no case was hæmorrhage into the pelvis or ureters found.

These naked-eye appearances were remarkable, but the changes found on microscopical examination were even more so. In nine out of the twelve cases there was general invasion of the cortex by lymphocytes, less often by actual hæmorrhage. The lymphocytic infiltration was so extreme as to leave scarcely any normal tissue intact. The sections showed a mass of lymphocytes scattered with glomeruli and broken fragments of tubules. This condition extended into the capsule of the kidney, which was much thickened by the cell deposit. The changes in the medulla were of a similar nature, though less marked. Where blood-vessels appeared in longitudinal section and along the margins of the calices, the lymphocytes were found closely investing the vessel walls.

Such tubules as were visible showed degenerative changes. The glomeruli were much engorged and contained a few lymphocytes, but beyond some invasion of the glomerular capsule showed little other change.

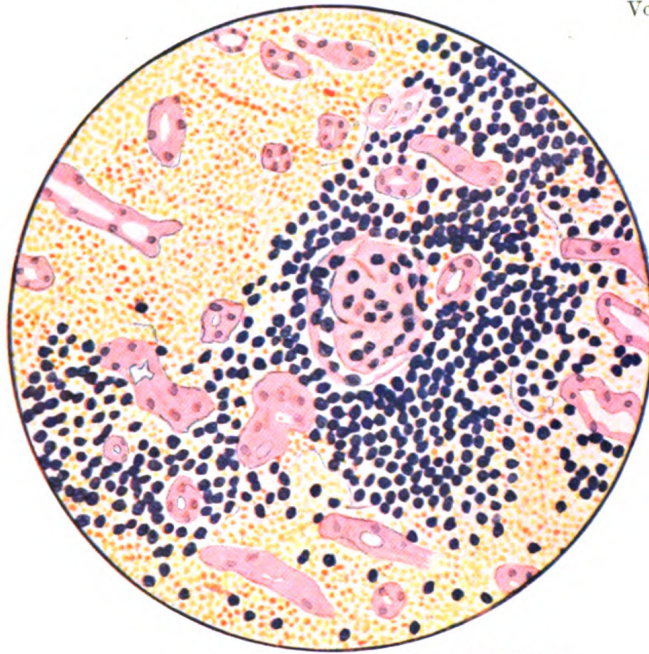
It is difficult to understand why the kidneys should show such extreme changes, surpassing those found in other organs. It might be suggested that an effort is made through the lymphatic channels of the kidneys to relieve the circulation of cells, which are either harmful or useless, and degenerate in their failure to deal with a microbic or toxic invasion. The excessive lymphocytic accumulation and consequent widespread destruction of the renal tissue would also account for the extensive hæmorrhages so frequently present.

The pancreas in one case was scattered with small greyish white areas, which microscopically proved to be areas of lymphocytes invading the interstitial tissue.

A testicle was examined in one case, and, though presenting no naked-eye changes, showed invasion of the connective tissue by collections of lymphocytes.

The Alimentary Canal.—The stomach sometimes showed small submucous and peritoneal hæmorrhages and blood-stained mucosa, but more often nothing abnormal was found. The small intestines sometimes contained unaltered blood or were scattered with submucous and peritoneal hæmorrhages. Peyer's patches almost invariably shared in the general hyperplasia of lymphoid tissue and appeared much swollen, and microscopically they showed marked enlargement of the follicles owing to the accumulation of lymphocytes, which had also invaded the underlying muscular coat and neighbouring villous processes. In no case was ulceration found.

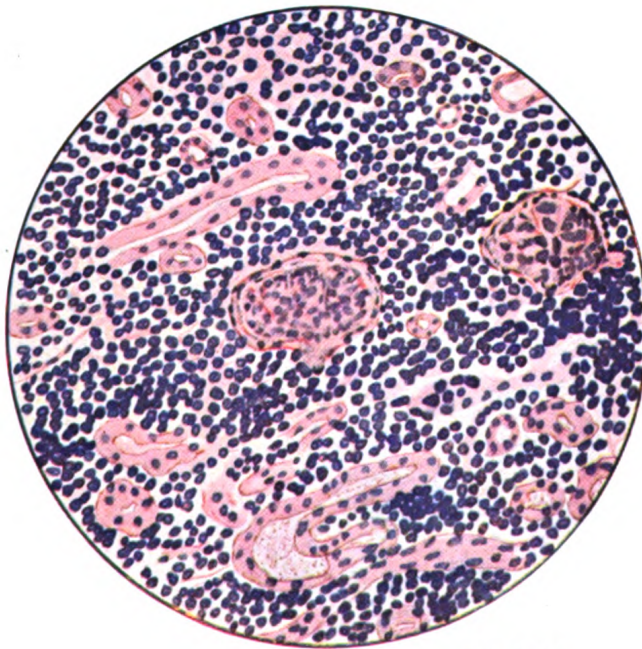
The bones exhibited no change, such as subperiosteal hæmorrhage. The bone marrow varied in colour, and was sometimes pale or dark red, but more often bright red and gelatinous, and, with the exception of one case, showed no obvious increase in amount. Films taken from the marrow in four cases showed an excessive number of lymphocytes, both large and small, almost entirely replacing the normal cells. The skin, as previously described, was of a pale, often lemon yellow tint, and was usually scattered with numerous petechiæ, but in some cases large areas of subcutaneous hæmorrhages and an appearance of extensive bruising were found. Histological section showed the presence of a mass of red blood-corpuscles and lymphocytes situated in the subcutaneous tissue.



J. G. F., del.

FIG. 1.

Kidney. R. J., aged 1 year 3 months. Hæmorrhage and lymphocytic invasion.
(E. P. 8. Obj. 3, Leitz.)



J. G. F., del.

FIG. 2

Kidney. B. W., aged 7 months. Lymphocytic invasion.
(E. P. 8. Obj. 3, Leitz.)

ETIOLOGY OF LYMPHOCYTHÆMIA.

(I.) The Bone Marrow.

Most recent authors—McCrae, Donnan, Neumann, Emerson, and Treadgold [12]—are strongly of opinion that the bone marrow is the primary seat of disease in acute lymphocythæmia and allied blood diseases. Neumann, with Wolff and Pappenheim [5], claim that the disease represents a pathological process capable of attacking spleen, liver, glands and bone marrow; when confined to the first three of these organs the blood shows no change, and the condition is described as “pseudo-leukæmia”; as soon as the marrow is invaded “sarcomatous tissue,” compelled by the hard, inelastic bony capsule, invades the vessel walls, and so long as the endothelium of the vessels remains intact the stage is termed “alymphæmic pseudoleukæmia.” With the passage of lymphocytes into the blood-stream leukæmia sets in; if only to a slight degree, the name “sublymphæmic lymphomatosis” is applied; if marked, then a state of “lymphatic leukæmia” prevails.

Treadgold [12], in an exhaustive account of chloroma and acute lymphocythæmia (not, however, with particular reference to its occurrence in early life), brings strong evidence in support of a primary affection of the bone marrow, and quotes Flexner’s experiments with a cytotoxic serum (lymphotoxin), which, when injected, gave rise to the proliferation of lymphocytes in the marrow and their appearance in other parts of the body. He decides positively that this formation of lymphocytes constitutes a tumour of malignant nature arising in the marrow, while the lymphocytic invasions of the various organs—the glands, spleen and kidney—are in reality metastases.

The microscopical examination made of the bone marrow in four of our cases showed in each an excessive number of lymphocytes both large and small, resembling those in film preparations from lymphatic glands and other organs; but their appearance did not suggest that they were originally derived from the marrow. With one exception the marrow in nine cases showed no increase in amount, and its colour varied from a dark to a pale red.

Such an origin as the marrow does not seem satisfactorily to explain either those cases in which the number of lymphocytes in the blood steadily declined from a high to a low figure or those in which there was only a condition of relative lymphocythæmia at the single examination made shortly before death.

If the marrow is the primary seat of growth, malignant in nature and capable of giving rise to metastatic deposits, the progress of such disease should be marked by an increasing rather than a decreasing lymphocytosis. Further, such an explanation does not account for those acute cases whose duration is apparently not more than one or two weeks. No growth, however malignant, has been known to run so rapidly fatal a course.

(II.) *The Thymus.*

The view that the thymus is the primary seat of disease has been brought forward by Frederick Taylor [11], who records a case showing marked thymic enlargement with extensive lymphocytic invasion and proliferation of the gland. He quotes four of five cases reported by Rose Bradford and Batty Shaw, in which the thymus was persistent.

In one of our twelve cases (H. S., aged 3) the thymus was enlarged, somewhat fibrotic, and contained areas of caseation and hæmorrhagic foci; microscopically there was in addition lymphocytic infiltration of the connective tissue and proliferation in the adenoid portions. In two other cases, though there was no enlargement of the thymus, there was evident lymphocytic invasion of the gland, but not in excess of the changes found in other parts.

(III.) *Microbic Infection or Toxæmia.*

A tempting explanation of the causation of lymphocythæmia is provided by bacteriological evidence of blood infection in a certain number of recorded cases and by some of the clinical features.

The temperature is always irregularly raised, and the hæmorrhages so commonly found resemble those occurring in the course of certain septicæmias. Among other authors, Emerson [5] mentions the three cases already alluded to and recorded by Holst, in which streptococci were obtained from the knee-joint, glands and heart's blood in one and from the marrow in another. Pincus [9] quotes Askanazy as supporting the transmission of infection through the damaged mucosa of the mouth, and gives Obrastzow's account of the isolated instance of a nurse who was reported to have contracted the disease after attending a fatal case.

In four of our collected cases, evidence was found post mortem of streptococcal infection:—

(1) D. R., aged 4; short streptococcus obtained in pure culture from the heart's blood and spleen, and in film preparations from the femoral marrow.

(2) H. S., aged 3; short streptococcus obtained in pure culture from the heart's blood, spleen and marrow. Inoculation of a subculture into a guinea-pig caused a fatal septicæmia on the sixteenth day, and the same streptococcus was recovered from the heart's blood.

(3) R. J., aged 15 months; short streptococcus in pure culture from—
(a) the blood taken from the ear on the day before death; (b) spleen puncture one hour post mortem; (c) heart's blood, spleen, kidney, liver, and femoral marrow thirty-six hours post mortem; short streptococci also present in smears taken from each. Inoculation of a subculture into a mouse produced a fatal septicæmia on the third day, and the streptococcus was recovered from the heart's blood.

(4) D. P., aged 3 years and 7 months; short streptococcus obtained in pure growth from the heart's blood.

Fermentation tests were applied to subcultures from H. S., R. J., and D. P. All agreed in fermenting saccharose, lactose, and raffinose (two of them fermented salicin as well), in clotting and acidifying milk, and in their reluctance to grow on gelatine.

From its behaviour in subculture it would seem that this short form of streptococcus belongs to the streptococcus salivarius group [1].

Though suggestive, the finding of streptococci in pure culture cannot be accepted as proof of such infection being the primary cause. It is impossible to dispose of the insuperable objection that with one exception the cultures were all obtained post mortem, and that their presence is most likely due to an intercurrent or terminal infection. That they belong to the salivarius group of streptococci points to such infection being derived from the mouth, and is of importance in association with the enlarged and septic state of the tonsils, carious teeth, swollen, hæmorrhagic gums commonly found in severe cases of lymphocythæmia.

Cabot [3] attributes the marked ante-mortem fall in the number of lymphocytes to the influence of intercurrent disease, such as septicæmia. In Holst's cases the same association was found.¹

In the four cases in which streptococci were obtained, the leucocyte counts showed the following variations, which agree with Cabot's statement :—

(1) D. R. Fall in leucocyte count in three weeks from 61,000 to 14,000 per cubic millimetre on the day before death (lymphocytes, 60,750 to 13,600).

¹ *Vide supra*, p. 156.

(2) H. S. Leucocytes, 14,000 per cubic millimetre on the day before death (lymphocytes, 13,460).

(3) R. J. Fall in leucocyte count in three days from 29,000 to 5,750 per cubic millimetre on the day before death (lymphocytes 26,670 to 5,080) (*see* fig. 2).

(4) D. P. Leucocytes, 7,500 per cubic millimetre on the day of death (lymphocytes, 7,230 per cubic millimetre).

In none of these cases was there a relative increase in the polymorphonuclears corresponding with the lymphocyte fall.

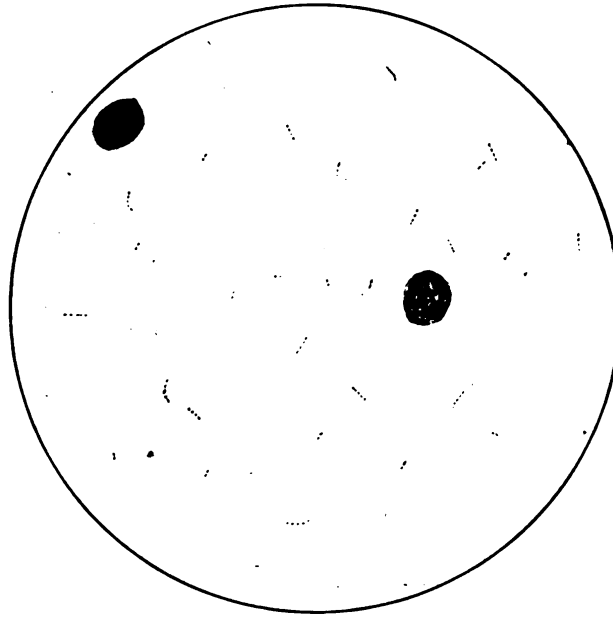


FIG. 2.

Blood-film (taken post mortem). R. J., aged 1½. Leucopenia, white blood-corpuscles, 3,500 per cubic millimetre (day before death); many short streptococci.

(E.P. 8. Objective $\frac{1}{10}$, oil immersion.)

On the other hand, in the case of A. B., aged 9, cultivations of the blood taken from the arm during life, of the heart's blood and spleen six hours after death, proved sterile, although the leucocyte count showed a steady decline in three weeks from 126,000 to 15,000 per cubic millimetre on the day before death.

Treadgold reviews the arguments for and against an infectious origin and decides very positively against, partly on the ground that an organism is seldom found at all and that in the few cases in which cultures were obtained they usually belonged to the septic variety and merely represented an intercurrent infection. He also attributes the raised temperature to the action of the circulating products of degenerated marrow lymphocytes on the thermogenic apparatus.

On the whole, therefore, the bacteriological evidence in favour of a primary streptococcal origin, though suggestive, is not sufficient to admit

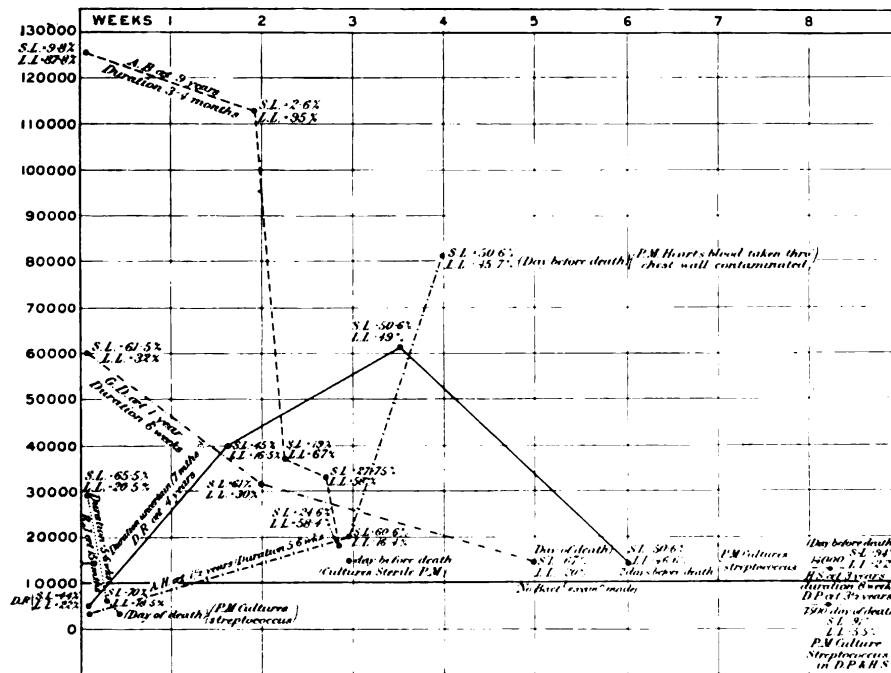


FIG. 3.

Chart showing variations in the leucocyte counts in cases of fatal lymphocythæmia.

of support; but it seems highly probable that an intercurrent infection does considerably modify the changes shown by the blood, possibly by an inhibitory influence on cell formation in the marrow and adenoid tissues.

On the other hand, the clinical picture shows strong resemblance to an acute infection, by the extremely rapid course of the disease in

TABLE OF BLOOD-EXAMINATIONS MADE IN

Case	Hæmoglobin	Red Corpuscles	Colour Index	Leucocytes	Polymorphonuclears
		Per c.mm.		Per c.mm.	Per cent. Per c.mm.
(1) W.J.	35 per cent. 33 per cent. 35 per cent.	(Apl. 18) 3,000,000 (May 3) 3,000,000 (May 23) 2,800,000 (May 31) 2,000,000	0.58 0.87	1,000,000 272,000 622,000 500,000	1.5 = 15,000
(2) E.M.H.	38 per cent.	Imperfect record. $\frac{W}{R} = \frac{1}{31}$			
(3) W.B.	Blood condition not	recorded.			
(4) D.R.	(Aug. 1) 38 per cent. (Aug. 11) 45 per cent. (Aug. 29) — (Sep. 14) 22 per cent. (2 days before death)	2,584,000 3,700,000 2,284,000 1,424,000	0.7 0.6 — 0.78	5,000 40,000 61,000 14,000	30.0 = 1,500 31.5 = 12,600 0.4 = 244 2.0 = 280
(5) A.H.	(Nov. 8) 32 per cent. (Dec. 1) 20 per cent. (Dec. 8) 15 per cent. (day before death)	2,554,000 1,839,000 1,106,000	0.68 0.54 0.68	3,000 20,000 83,000	— 20.4 = 4,080 3.6 = 2,988
(6) H.S.	32 per cent.	1,340,000	1.1	14,000	1.7 = 238
(7) R.J.	(Feb. 15) 35 per cent. (Feb. 16) 30 per cent. (Feb. 17) day of death	1,326,000 1,025,000 1,006,000	1.2 1.45 —	29,000 5,750 3,500	8.0 = 2,320 11.5 = 66,325 —
(8) G.H.	On day of death 20 per cent.	1,200,000	0.83	196,800	0.2 = 393
(9) A.B.	(Mar. 27) 10 weeks after admission, 40 per cent. (Apl. 9) 40 per cent. (Apl. 12) 25 per cent. (Apl. 15) 25 per cent. (Apl. 16) 20 per cent. (Apl. 17) day before death	1,310,000 1,086,000 754,000 780,000 647,000 528,000	1.5 1.8 1.6 1.7 1.6	126,000 113,000 37,500 32,750 18,000 15,000	1.2 = 1,512 2.2 = 2,486 11.4 = 4,275 14 = 4,585 16.7 = 3,006 —
(10) D.P.				7,500	3.0 = 225
(11) G.D.	(July 12) 27 per cent. (July 25) 32 per cent. (Aug. 18) 30 per cent. (day of death)	1,046,000 1,198,000 1,024,000	1.2 1.3 1.4	60,000 31,500 14,000	4.75 = 2,850 3.5 = 1,102 11.3 = 1,582
(12) B.W.	65 per cent.	2,006,000	1.6	321,000	0.9 = 2,889

TWELVE CASES OF LYMPHOCYTHÆMIA.

Large Mononuclears		Small Lymphocytes		Large Lymphocytes		Eosinophiles		Basophiles		Myelocytes		Nucleated Reds
Per cent.	Per c.mm.	Per cent.	Per c.mm.	Per cent.	Per c.mm.	Per cent.	Per c.mm.	Per cent.	Per c.mm.	Per cent.	Per c.mm.	
0.8 =	8,000	56 =	560,000	41.7 =	417,000	—	—	—	—	—	—	4 normoblasts in counting 1,100 w.b.c.
—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	
4.0 =	200	44.0 =	2,200	22.0 =	1,100	—	—	—	—	—	—	
6.0 =	2,400	45.0 =	18,000	16.5 =	6,600	1.0 =	400	—	—	—	—	
—	—	50.6 =	30,866	49.0 =	29,890	—	—	—	—	—	—	
1.6 =	224	50.6 =	7,084	46.6 =	6,524	0.2 =	28	0.4 =	56	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	
1.6 =	320	60.6 =	12,120	16.4 =	3,280	1.0 =	200	—	—	—	—	
—	—	50.6 =	40,986	45.7 =	37,017	0.1 =	83	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	
1.7 =	238	94.0 =	13,160	2.2 =	308	0.4 =	56	—	—	—	—	
—	—	65.5 =	18,995	26.5 =	7,685	—	—	—	—	—	—	
—	—	70.0 =	4,025	18.5 =	1,063.75	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	4 normoblasts in counting 400 w.b.c.
—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	
0.2 =	393	84.5 =	166,296	14.0 =	27,552	—	—	0.1 =	197	—	—	1 normoblast seen in counting 1,000 w.b.c.
—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	
1.2 =	1,512	9.8 =	12,348	87.8 =	110,628	—	—	—	—	—	—	
0.2 =	226	2.6 =	2,938	95.0 =	107,350	—	—	—	—	—	—	
1.0 =	375	19.0 =	7,125	67.0 =	25,125	—	—	—	—	—	—	
—	—	27.75 =	9,077	58.0 =	18,995	—	—	—	—	1.6 =	600	1 normoblast seen in counting 500 w.b.c.
—	—	24.6 =	4,428	58.4 =	10,512	—	—	—	—	0.25 =	82	
—	—	—	—	—	—	—	—	—	—	0.3 =	54	
—	—	91.0 =	6,825	5.5 =	412.5	0.5 =	37.5	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	
0.5 =	300	61.5 =	36,900	32.0 =	19,200	0.5 =	300	—	—	0.75 =	450	2 normoblasts
0.5 =	157.5	61.0 =	19,215	30.0 =	9,450	2.0 =	630	1.0 =	315	2.0 =	630	5 normoblasts
0.3 =	42	67.7 =	9,380	20.0 =	2,800	—	—	—	—	0.66 =	92	2 normoblasts
—	—	33.4 =	107,214	65.7 =	210,897	—	—	—	—	—	—	

some of our cases, by the invariably raised temperature, by the frequency with which a septic condition of the mouth and throat appear to mark the onset of the illness.

(IV.)

The lymphatic glands and other adenoid tissues in our opinion play a prominent part in the causation of lymphocythæmia, but, as in the case of the marrow, their rôle is probably secondary to a microbic infection or toxæmia.

It is true that the enlargement of the glands was never very great, but it was sufficiently definite in the majority of cases to attract attention. As has been already stated, no positive increase of the marrow could be observed sufficient to suggest that the marrow was more involved than the glands.

A common histological feature of the changes found in the various organs was the collection of lymphocytes around the blood-vessels, which formed an investing sheath when seen in section parallel to their course. The vessels themselves were scarcely invaded at all and contained but few or no lymphocytes. Such a condition suggests that the massing of cells outside the vessel walls is due to the blocking of the perivascular lymphatics with accumulated lymphocytes.

The frequency with which the small lymphocyte is found in excess of the large is evidence that the glands take a definite share in the production of the disease in early life.

The following distinction may be drawn between the parts played by the marrow and lymphatic glands: In the one case a reaction by the *marrow* gives rise to a predominance of the large lymphocytes, in the other a reaction by the *adenoid tissues* is responsible for an excess of the small lymphocytes.

In those cases showing intermediate forms between the small and large lymphocyte no accurate separation into the two types of cell can be made; and their respective production by the adenoid tissues and marrow is equally inseparable.

The nature of the primary factor in the causation of lymphocythæmia is purely hypothetical; possibly it may prove to be some toxin, the result of perverted metabolism, such, for instance, as one of the cytotoxins obtained by Flexner.

In conclusion, we wish to express our warm thanks to members of the staff of the Hospital for Sick Children for kind permission to use the

No.	Name	Age	Sex
1	W. J.	2½ years	Male
2	E. M. H.	3 years, 3 months	Female
3	D. B.	10 years, 11 months	Female
4	D. R.	4 years	Female
5	A. H.	1½ years	Male
6	H. S.	3 years	Male
7	R. J.	15 months	Male
8	G. H.	2 years	Male
9	A. B.	9 years	Male
10	D. P.	3 years, 7 months	Female
11	G. D.	1 year	Female
12	B. W.	7 months	Female

notes and material provided by their cases. We are also much indebted to Dr. Leonard Guthrie for the use of the notes of Case VIII., and to Dr. D'Este Emery for his pathological report on the case; to Dr. F. E. Batten for the loan of slides illustrating Case I., and to Dr. H. Thursfield for his kindness in carrying out two animal inoculations.

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DISCUSSION.

The PRESIDENT (Sir T. Barlow) said that the Section was very grateful to the authors for their valuable paper. He had been much interested in the possibility of the condition being due to some infection. The only case under his own observation which he could recall at the moment was one which had been partly embodied in the present paper. In that, the first event was an exceedingly septic throat, which gave rise to the idea that the case was one of diphtheria with the supervention of streptococcal invasion. He feared that the investigation of the case was not so thorough as it should have been, but he remembered that there was an extensive involvement of glands in different parts of the body, some of which underwent some necrosis. One of them was incised and a little thin ichorous fluid exuded. Post mortem there was found some necrosis of portions of the glands. Hæmorrhage from the gums in these cases was very characteristic. The cases reminded him of

those of acute leukæmia which Dr. Bradford showed and described some years ago. The general conclusion of Drs. Forbes and Langmead was rather against infection as a direct cause. In his own case the septic throat might have been only a manifestation of the disease and not its starting point.

Dr. PARKES WEBER, in regard to the terminal drop in the number of white corpuscles in the authors' cases, said that in a case of acute lymphocytic leukæmia, which was published in the *Edinburgh Medical Journal* by Dr. K. Fürth and himself, the number of white corpuscles in the blood fell before death to only 3,000 in the cubic millimetre, so that there was actual leucopenia at the time of death.¹ He wished to refer to the use of the term "leucocytosis." He heard people talk of a "leucocytosis stage" of the blood in leukæmia, that is to say, a stage of leukæmia when the leucocytes were not extremely increased in number; but this he regarded as a very inconvenient use of the term leucocytosis. The word leucocytosis was best restricted to an increase in the number of white corpuscles when the increase constituted a definite vital reaction to some recognized exciting agent, such as to a streptococcal invasion of the body. In leukæmia, however, there was no known cause for the increase of leucocytes other than the leukæmia itself, and it was better not to speak of a "leukæmic leucocytosis." With regard to the origin of leukæmia in the bone marrow, he thought the general opinion in the last year or so was that leukæmia was not necessarily a primary disease in the bone marrow, but a more or less general disease of the lymphatic tissue all over the body. The part played in the disease by the bone marrow was, however, a very large one, especially in regard to the actual increase of white corpuscles in the circulating blood.

Dr. POYNTON pointed out how remarkable was the enlargement of kidneys in cases of this form of leukæmia in small children. He recalled a striking case of a child who had irregular fever, with marked anæmia, none of the blood-changes which had been mentioned, but general enlargement of glands, without notable enlargement of the spleen. The general enlargement of glands persisted for six weeks; finally a number of glands suppurated, and *Staphylococcus aureus* was obtained from the pus. And if the recent researches on the spirochæta were correct, then those cases of syphilis with an enlarged spleen and multiple enlargement of glands were very suggestive that the infectious theory was more likely to be correct than any other. He hoped the authors would not be too much put off by the idea of terminal infections, and he asked them to pursue the matter by experiments on animals. There seemed no reason why the streptococcus should not produce, under certain circumstances, such a condition as was present in those children. He had seen cases of malignant endocarditis in which there was an extraordinary condition of the kidneys without suppuration, resembling in some ways those occasionally seen in such cases as the authors were now describing, and streptococci were often

¹ *Edin. Med. Journ.*, 1905, N.S., xvii., p. 260, Case 2. Six days previously the blood-count had shown over 77,000 white cells in the cubic millimetre.

present in malignant endocarditis. Although much was known about those blood-changes, the essential facts as to what they really meant were still unknown. The leucocytosis in suppurative conditions was to him the most pertinent observation upon the blood in regard to these leukæmic states.

Dr. FORBES, in reply, said that he had been much interested to hear the details of the President's case, because he thought it threw light on the causation of some cases of lymphocythæmia. It suggested that the disease might originate primarily in an infection gaining entrance through the tonsils or the damaged mucosa of the mouth. That was the view which he had at first been inclined to support. In a recent paper by Treadgold on acute lymphatic leukæmia and chlorosis a microbic origin had been strongly opposed, and it had been stated that the condition of the throat was only a secondary and intercurrent complication. The work of other authors and the study of the cases collected in the paper just read had led him (Dr. Forbes) to the belief that a streptococcal infection was merely a terminal condition. It could not be proved to be otherwise unless a number of positive cultural results were obtained during life, yielding, on animal inoculation, evidence of transmitted infection and pathological changes in animals similar to those found in cases of lymphocythæmia. The presence of streptococci in the disease under discussion was comparable with the terminal septicæmia occasionally found in cases of lympho-sarcoma and lymphadenoma, conditions which could not be attributed on that ground to a primary microbic origin. Treadgold, among others, was strongly of opinion that acute lymphatic leukæmia arose *primarily* in the bone marrow, and was malignant in nature. That view he (Dr. Forbes) was not prepared to support, but considered the changes in the marrow and adenoid tissues were possibly secondary to a toxæmia. He agreed with Dr. Parkes Weber that the loose use of the terms leucocytosis and lymphocytosis was confusing, and should be avoided in reference to definite forms of blood-disease such as lymphocythæmia.

Dr. LANGMEAD said that clinically the condition more closely resembled septicæmia than anything else, especially in the rapid course, the progressive anæmia, the irregular and remittent temperature, the many hæmorrhages, and the death in a few weeks. He still had an open mind as to the etiology. In most such cases there was no doubt as to the condition before examining the blood. They had seen nine cases themselves in three or four years, and they all presented a very definite clinical picture. That fact also seemed to show that the disease is not so rare as is sometimes supposed.

Right Hemiplegia and Atrophy of Left Optic Nerve.

By LEONARD G. GUTHRIE, M.D., and STEPHEN MAYOU, F.R.C.S.

THE patient, T. S., is a boy, aged 7. On July 17, 1906, he was run over by a cab, and was admitted to St. Mary's Hospital suffering from concussion of the brain and fracture of several ribs on the left side. His progress was satisfactory until July 21, when signs of pneumothorax (dyspnoea, limitation of chest movement on left side, tympanitic resonance and displacement of heart to right) appeared. Temperature varied from 101° F. to 103° F. for a few days, and remained elevated for a fortnight.

On July 23 (six days after the accident) he suddenly became aphasic and paralysed on the right side. His right pupil was larger than the left; both reacted to light. No note was made as to vision or state of optic disc, but his mother states that he seemed blind in the left eye on this day, and has been so ever since. Power in the limbs and speech improved, and he was discharged from hospital on August 6, 1906.

Present Condition (November 5, 1907).—Healthy in appearance. Intelligence unimpaired. Paresis of the right face (supranuclear type), arm and leg is present, with slight ataxy and athetosis of the right upper limb. The right hand is almost useless. Tendon reflexes are exaggerated; plantar response is extensor. Tongue deviates to the right. He walks quickly and without assistance, but gait is of hemiplegic type. Eyes: Right is normal; left pupil reacts to about half the extent of right; visual perception of light with projection only on the temporal side. [Two months later all perception of light disappeared, together with the pupil reflex.] Media clear. Left fundus: Disc is dead white in colour, the edges being sharply defined. Arteries are very minute and thread-like, and can only be traced into the retina for a short distance. Veins are small, and some of them have evidently been thrombosed. On the disc there is a twisted vein, which possibly communicated with the choroidal circulation round the disc. Along the course of the vessels can be seen the remains of old exudation into the perivascular lymph spaces. To the temporal side of the disc there is a white area of old exudation, which extends outwards to the macula, in which situation there is also a marked stippled condition. In the

extreme periphery on the nasal side are a few areas of choroidal atrophy and pigmentation. The changes in the fundus are not typical of simple embolism of the arteria centralis retinæ, but of complete occlusion by thrombosis. The choroidal vessels at the posterior pole exhibit no changes and are evidently patent. Speech: There is slight motor dysphasia and verbal amnesia. Sensation appears to be normal except for slight blunting to touch on right leg. Hearing is normal. Vascular system: Heart's action is irregular; apex beat in fifth left interspace; area of dulness normal. A faint systolic bruit is heard occasionally at the apex and is conducted into the axilla. Pulsation can be seen and felt in the suprasternal notch. The right carotid and both subclavians can be felt pulsating, but no pulsation can be detected along the course of the *left* carotid, nor in the direction of the left facial and superficial temporal arteries. Nothing in the shape of a fibrous cord can be detected in the course of the left common carotid or its branches.

REMARKS.

Unilateral atrophy of the optic nerve and contralateral hemiplegia are conditions sufficiently uncommon to be worth recording. In this instance the simplest explanation is that when pneumothorax supervened on the accident, thrombosis occurred in the displaced heart, whence a large clot became dislodged and completely blocked the left carotid artery. No trace of this vessel or of its terminal branches can be detected. It is possible, of course, that the whole vascular supply of the left neck, face and brain may be abnormal, and that the place of the left common carotid is taken by separate smaller vessels. At least two instances of absence of the common carotid have been recorded. However this may be, the probability is that occlusion has arisen in the manner suggested in vessels which answer to the left Sylvian and left ophthalmic arteries, for unilateral atrophy of the optic nerve, associated with contralateral hemiplegia, is highly suggestive of occlusion of these cerebral vessels on the side of the optic atrophy. The occluded vessels are presumably branches of the middle cerebral, supplying some part of the motor tract, and of the ophthalmic artery or of some of its branches, including the arteria centralis retinæ, which supply the optic nerve and its sheath.

Complete unilateral optic nerve atrophy with contralateral hemiplegia cannot be produced by a lesion involving the optic tract and the motor tract on one side, because (except in cases where there is no decussation

of the tract fibres at the chiasma) the succeeding atrophy of the optic nerves must be bilateral and also incomplete and hemiopic in character. This distinguishes such cases from the present, in which the atrophy of the optic nerve is entirely unilateral, and therefore due to a lesion of the nerve itself.

One of us, in conjunction with Dr. F. E. Batten [1], has recorded in the *Transactions of the Clinical Society* for 1903 three cases of unilateral optic atrophy and contralateral hemiplegia. In the first of these, an anæmic girl, aged 25, the symptoms were: sudden onset of right hemiplegia, sudden loss of vision in the left eye, recurring fits of Jacksonian epilepsy, increasing coma, and death in twenty months.

At the autopsy occlusion of the left middle cerebral artery and softening in its area of distribution, atrophy of the left optic nerve, secondary degeneration of the spinal cord and optic chiasma were found.

The condition of the disc during life was attributed by Mr. Marcus Gunn to thrombosis or hæmorrhage into the nerve sheath. It is impossible to say whether the occlusion was due to embolism or thrombosis of the vessels.

The second case was that of a boy, aged 12, who, after union of a simple fracture of the left femur, had a febrile attack lasting a fortnight and associated with pain at the site of the fracture. A fortnight later he developed right-sided hemiplegia, followed by failure of vision in the left eye, with signs of retrobulbar neuritis, resulting in partial atrophy of the left optic disc.

All the symptoms disappeared in about six months, except that slight pallor of the disc remained. Here the condition was probably due to thrombosis of branches of the left Sylvian and of the left ophthalmic arteries. Polio-encephalitis may have been the cause.

The third case was in a woman, aged 22, who, nine days after confinement, had three eclamptic attacks, followed immediately by left hemiplegia. Three months later she discovered that she was almost blind in the right eye. Ophthalmoscopic examination showed extensive atrophy of the right optic nerve. Here, probably, a thrombus was swept from the heart into the Sylvian artery, and subsequently blocked the right ophthalmic artery by extension of the embolus.

Neither of the two latter cases proved fatal, but occlusion of the Sylvian and ophthalmic vessels on the same side was probably the cause in all.

Siegrist [5] has reported two somewhat similar cases following ligation of the common carotid artery. But in these the choroidal

vessels were also thrombosed, which is not so with our own patient (T. S.).

Instances of obstruction of the *arteria centralis retinae*, associated with contralateral hemiplegia, have also been recorded by Gowers [3], Hughlings Jackson [4], and Elschmig [2]. R. T. Williamson [6] has described unilateral retinal changes in cerebral hæmorrhage, embolism and thrombosis.

We are indebted to Mr. W. T. Hancock for notes of one more case resembling our own.

It would seem that simple embolism of the *arteria centralis retinae* alone will not account for the condition of the disc in most reported cases, but that a more complete occlusion by thrombosis is responsible for the ophthalmoscopic appearances. Such thrombosis may, however, be the result of previous embolism.

The comparative rarity of unilateral optic atrophy and contralateral hemiplegia remains for consideration. The reason of this rarity is probably an anatomical one. The optic nerve and its sheath are supplied by the branches of the ophthalmic artery, itself a branch of the internal carotid. The nasal branch of the ophthalmic artery courses through its orbit on its inner side and anastomoses with more or less regularity with the angular branch of the facial artery. The degree of inosculation, however, varies greatly, and presuming blockage of the ophthalmic artery to occur, the restoration of circulation in the optic nerve will depend upon the amount of distal anastomosis between the ophthalmic and other vessels which exists.

Should the blockage of the ophthalmic artery extend beyond its branches to the nerve, restoration of the circulation to the nerve is impossible. On the other hand, should the blockage be only of the trunk of origin of the ophthalmic artery, collateral circulation may restore function to the nerve.

In our own patient (T. S.), as previously mentioned, no trace of the facial artery can be found on the left side, therefore anastomosis between it and the nasal branch of the ophthalmic artery cannot exist. But the choroidal vessels which are derived from the short ciliary branches of the ophthalmic artery are obviously patent. Hence they must be supplied by some vessels other than the ophthalmic, or the occlusion must be of the *arteria centralis retinae* alone and not of its parent stem.

In none of the other cases to which reference has been made is the condition of the great vessels in the neck mentioned, except when the symptoms followed ligation of the common carotid.

It is impossible to decide, in the case of T. S., whether the apparently missing vessels are obliterated by thrombosis or whether they are congenitally absent. The latter supposition seems but to offer one rare condition in explanation of another. Yet complete obliteration of all the carotids on one side, including their terminals, the middle cerebral, and ophthalmic arteries, is hardly compatible with the boy's general condition of physical and mental health.

Complete blockage of the Sylvian artery alone, as instanced in Dr. Batten's case, leads to so wide a degeneration of an important area of the brain that recovery to any considerable extent is hardly possible.

The absence of fits of any kind and preservation of intellect suggest that in T. S. only the Sylvian branches which supply the internal capsule and its neighbourhood are occluded and so cause hemiplegia, whilst a similar condition of the left arteria centralis retinae accounts for the ocular condition described.

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A Case, three years and nine months after complete Excision of the Larynx, showing an Improved Method of Speaking.

By CHARTERS J. SYMONDS, M.S.

M., AGED 52, admitted to Guy's Hospital, July, 1904, with extensive malignant disease of the larynx affecting primarily the left side. The disease had penetrated the left ala and involved the muscles. Complete extirpation was carried out in the usual way, together with removal of the thyro-hyoid and sterno-hyoid muscles on the left side. The fascia, with lymphatics, and the left thyroid lobe, together with all surrounding fascia, were also removed. The trachea was attached to the skin above the sternum and the pharynx closed with three rows of catgut sutures. Primary union was obtained.

The patient is shown in order to exhibit his phonetic power, especially with the aid of the device suggested by Professor Gluck, which, by inserting a rubber tube into the cannula, carries a current of air to the lips. By this means he can be heard at some distance, and is able to carry on his duties as a tax collector in a country district. In the discharge of his duties he has to speak his reports to the magistrates, to barristers and the Somerset House officials, and is heard without difficulty. There is no difficulty in swallowing.

A Case showing the Phonetic Condition after Removal of One Vocal Cord.

By CHARTERS J. SYMONDS, M.S.

M., AGED 55, is shown in contrast to the case of total extirpation of the larynx. On October 17, 1906, the left cord was removed for a strictly localized malignant growth. The excellent voice retained represents the average phonetic result when the arytæmoid has not been interfered with and the opposite cord has not been injured in the operation. The laryngoscope shows approximation of the false cord with the true cord on the sound side.

DISCUSSION.

Mr. SAMPSON HANDLEY asked whether in these cases there were any enlarged glands, as it seemed to him to be a very important question whether it was worth while operating for laryngeal and pharyngeal cancer when the glands were already enlarged. Perhaps the present cases would help to settle the point.

Mr. SYMONDS, in reply, said that in the cases shown there was no glandular disease. In another case enlarged glands below the thyroid lobe on both sides were removed, but the patient was quite well nine years afterwards. He mentioned yet another case in which he had performed hemilaryngectomy and had previously removed a mass of carcinomatous glands which were fixed to the tissues on the right side of the neck. The patient survived for five years and died of pneumonia.

Two Cases of Lymphangioplasty for the Brawny Arm of Breast Cancer.

By W. SAMPSON HANDLEY, M.S.

THE two cases I show to-night are the first in which the operation of lymphangioplasty has been performed. I may remind you that the method will be found described in the *Lancet* of March 14, 1908. My thanks are due to Mr. A. F. Palmer, Medical Officer and Registrar in the Cancer Wing of the Middlesex Hospital, for the care and attention he has devoted to the after-treatment of the cases.

CASE I.

The patient, a woman, aged 56, was admitted into the cancer wards of the Middlesex Hospital on January 18 last under my senior colleague, Mr. J. Bland-Sutton, who kindly transferred her to me for treatment. In 1894 a portion of the right breast was removed for carcinoma at Chichester Hospital. In 1896 recurrences in the breast and axilla were removed at St. Mary's Hospital. In 1903 two or three small recurrent growths were removed from the axilla. In 1905 the right arm became swollen; it slowly became paralysed, and has been the seat, during the past three years, of excruciating pain, which frequently kept her awake at night. On admission there was no evidence of cancer in the body in the form of palpable tumours. The right nipple still remained intact and was not indrawn, and there was no lump in what remained of the right breast, nor was there any axillary mass of growth. The chest and abdomen were free from deposits. The growth was evidently an atrophic scirrhus, which had undergone an almost complete process of natural cure. The right arm and hand below the deltoid insertion were greatly swollen. The œdema pitted slightly on pressure, though it approached the solid variety. There was complete paralysis of the limb, save that the third and fourth fingers could be moved slightly. Sensation was lost in the thumb and first finger, but not in the second, third, and fourth. The hand was warm and of natural colour. Flexion of the elbow was only possible through 15 degrees or rather less.

On February 1, under chloroform, a number of silk threads, each running upwards from the wrist to the loose tissue upon the chest wall, just below the axilla, were buried in the subcutaneous tissue. The operation produced no general disturbance of note. On the next day it

was obvious that the bandages were loose, and the strapping upon her fingers was in the same condition and had to be frequently replaced. On February 6 it was noted that the arm and hand were quite flabby and much reduced in size. The skin was much wrinkled and hung awkwardly on the fingers in folds. On February 7 the patient remarked that she "saw her knuckles for the first time for years." The movements of the fingers were beginning to return and she was able to grasp very feebly. The arm was still quite paralysed. On February 10 the forearm and hand began to present an almost normal appearance, but much swelling of the upper arm remained. On February 19 the swelling about the elbow, which as the patient lay was the lowest point of the limb, had somewhat increased, and the limb was ordered to be put up on an inclined plane in an extended position and to be bandaged during the night. On February 24 the limb was continuing to diminish in size, though less rapidly than at first. Unfortunately, measurements of the limb previously to operation were omitted, so that no accurate record remains of its very rapid and marked subsidence in the earliest days after operation. Its slower subsequent subsidence is recorded in the following table:—

	Feb. 6	Feb. 13	Feb. 18	Feb. 19	Feb. 21	Feb. 24	April 6
Circumference of arm —	in.	in.	in.	in.	in.	in.	in.
At wrist	7 $\frac{1}{4}$	6 $\frac{7}{8}$	6 $\frac{5}{8}$	6 $\frac{3}{4}$	6 $\frac{1}{2}$	6 $\frac{3}{8}$	6
4 $\frac{1}{2}$ in. above wrist...	8 $\frac{1}{2}$	8 $\frac{1}{8}$	8 $\frac{1}{4}$	8	7 $\frac{3}{4}$	7 $\frac{5}{8}$	6 $\frac{3}{4}$
Just below the elbow ...	10 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{4}$ ¹	10 $\frac{1}{8}$	9 $\frac{3}{8}$	9 $\frac{5}{8}$	9 $\frac{3}{8}$
8 $\frac{7}{8}$ in. below the acromion	11	8 $\frac{7}{8}$	10 $\frac{1}{2}$ ¹	10 $\frac{3}{8}$	9 $\frac{1}{2}$	9 $\frac{3}{8}$	9 $\frac{1}{4}$

¹ Temporary return of swelling owing to dependent position of elbow.

Note.—The operation was performed on February 1.

In conclusion, it may be stated that the patient has lost her pain and that she is very grateful for the operation. Flexion of the elbow is now possible through about 110 degrees, as compared with about 15 degrees or less before the operation. The movements of the hand continue to improve, so that the patient can hold a pin between the finger and thumb. It will be interesting to see whether the muscles of the arm recover their power, but at present there is no sign of this. The measurements of the limb in this case have continued to decrease up to the time of writing (April 8, 1908).

CASE II.

This patient, E. A., a woman, aged about 50, first noticed a small lump in the left breast in 1897. In 1899 the breast was removed at the North-West London Hospital by Mr. Frederick Durham. Operations for recurrence, four in number, have been performed at intervals since. The first of these took place in 1902, the second in 1904, the last in 1906. She was admitted to the cancer wards of the Middlesex Hospital on January 3, 1908, for inoperable recurrence in the left axilla and near the scar, and for swelling of the arm, and was kindly transferred to me for treatment by my senior colleague, Mr. John Murray. On admission the left arm, and more especially the forearm, hand and fingers, are much swollen, and the limb is completely paralysed. The hand is purple in colour, but the fingers are warm. On account of the swelling of the tissues the radial pulse cannot be felt. The œdema pits slightly on pressure, although in places it is almost solid. The pain in the arm is occasionally most severe, and in consequence of it the patient suffers much from insomnia. Amputation had been suggested before the patient's admission, and her condition was so miserable that she was prepared to welcome the loss of the limb.

Owing to the axillary recurrence and to the consequent absence of loose skin on the thoracic wall in front, it was deemed well in this case to carry the threads up on the posterior aspect of the axilla. They terminated in the subcutaneous tissue over the scapula. Four pairs of threads were used, as in the previous case; two on the flexor and two on the extensor aspect of the arm.

MEASUREMENTS OF ARMS.

	Right Arm (normal)	LEFT ARM				
		Before operation	Mar. 3	Mar. 13	Mar. 18	April 6
	in.	in.	in.	in.	in.	in.
4½ in. above the wrist	7¼	9¼	7¾	6⅞	6⅝	7
Just below elbow	8¾	11¼	9¾	8⅞	9¾	9
1½ in. above elbow	8¾	12½	10	9⅞	10½	10
8 in. below acromion	9	12	10½	10¾	9¾	9¾
Just below fold of axilla	10	10¾	11½	11¼	11	10⅝

The swelling in this case, as in Case I., subsided from below upwards, the subsidence being first noticed in the hand and forearm. The excruciating pain has been entirely relieved and the patient has good nights. She appears to be putting on flesh, and her worn expression has been replaced by a more contented look. She still has a certain amount of axillary pain due to the recurrent growth in the axilla.

DISCUSSION.

Mr. CECIL LEAF desired to compliment Mr. Handley on the excellent results in his two cases. Dr. Lomer, in a recent paper, discussed the curability of cancer, and among other points which he noticed was the fact that patients who bled much in advanced cancer were often much the better for it. Dr. Copeman had suggested that the fact might be utilized in advanced cases of cancer with brawny arm, and had suggested to him the advisability of trying venesection. At that time Mr. Leaf had under his care at the Cancer Hospital three cases of advanced carcinoma of the breast with brawny arms, and on all of them he performed venesection, removing some $\frac{3}{4}$ pint of blood. In all of them the œdema of the arm rapidly diminished, although he regretted to say it had subsequently again increased. But if, in these cases, venesection could be performed repeatedly, he believed that not only would the œdema be diminished, but that the mere fact of withdrawing blood might remove the deleterious products in the blood, and so diminish the growth of the cancer. He suggested that Mr. Handley's operation could with advantage be supplemented by venesection, and he should be glad to know the result of such a measure.

Dr. PARKES WEBER asked whether Mr. Handley's operation would be of any use in cases of so-called sporadic elephantiasis of the lower extremity, particularly in an early stage.

Dr. ZUM BUSCH said that three or four years ago he had had some correspondence with Professor Lauenstein, who had told him that he had for some time been making experiments on the treatment of lymphatic enlargement of the scrotum by introducing a silver wire beneath the skin of the scrotum and leaving it there, and that he had had good results. It was a very similar treatment to Mr. Handley's.

Dr. COPEMAN said that in one of Mr. Leaf's three cases treated by venesection the effect was nearly as good as that in Mr. Handley's cases shown that evening. If, as Mr. Handley said, the lymphatics became converted into solid cords, the good effect of venesection was difficult to understand unless, owing to the diminution of pressure, the veins were enabled to carry off the lymph. In one of Mr. Leaf's cases the recovery of use of the arm was more striking than in Mr. Handley's cases. Possibly the combination of methods might yield even better results.

Mr. HANDLEY remarked on the short period of benefit from the venesection. He thought it better that the two operations should be tried in separate cases, in order that the results could be compared. In answer to Dr. Parkes Weber, he thought that the method was applicable to elephantiasis, not only to the sporadic cases, but also to the filarial cases in which the parasite had died out. He was interested in Dr. Zum Busch's remarks, as he was not aware that Lauenstein had published anything of the kind. With regard to the recovery of the use of the arm after venesection, he did not think that the two cases were comparable, for the reason that the arm of his first patient had been paralysed for three years, so that it was not fair to expect much recovery at present of power, as three months had not yet elapsed since the operation.

**Case of Ascites ; Paracentesis performed twenty-five times
in one year and three months ; patient quite well seven
years later.**

By FRANCIS HAWKINS, M.D.

J. C., AGED 43, a gardener, stated that he had not known what illness was until August, 1899, when he noticed that his feet were somewhat swollen, that he was losing flesh, his abdomen was increasing in size, and that subsequently he had a difficulty in passing urine.

On September 6, 1899, he came under my observation. He had never been a heavy drinker, but had taken a small quantity of whisky every night ; he had never suffered from venereal disease, nor vomiting, epistaxis, hæmatemesis, or melæna. He was a thin, spare man with small dilated venules over the cheeks. His feet and legs were œdematous. There was some slight œdema of the chest wall, that is to say, the stethoscope left a slight depression ; there was also some œdema over the sacral region. The abdomen was greatly distended, and there was every evidence of free fluid within the abdominal cavity. The heart sounds were normal, but there was some œdema of the bases of both lungs. He passed during the first twenty-four hours 19 oz. of urine, specific gravity 1016. His temperature was 98° F.

On September 11, five days after admission, the abdomen having increased in size, paracentesis was performed, 23 pints 16 oz. of clear amber-coloured fluid being withdrawn. Nothing abnormal could be felt in the abdomen, and the liver dulness was about normal.

On September 17 he was again tapped, and 19½ pints were withdrawn. Four days later the urine, which had increased in quantity, was

for the first time found to contain blood and albumin ; specific gravity was 1014.

On September 30 paracentesis was again performed ; 23 pints of fluid were removed, and on October 9, 25½ pints. After this he complained of shooting pains all over the abdomen, and the temperature rose to 99·6° F. The œdema of the legs now began to subside. Blood and albumin were constant in the urine. The fluid within the abdominal cavity having reaccumulated, paracentesis was again performed on October 25 ; 36 pints were withdrawn, and fourteen days later 23 pints 15 oz. He now complained of severe colicky pains, which were relieved by carminatives and warm fomentations. He subsequently became so much better that he was allowed to get up and go about the ward in a wheel chair.

On November 20 paracentesis was again performed, 29 pints of fluid being withdrawn. The œdema of the legs had now almost entirely disappeared.

On December 5 paracentesis was repeated, and 23 pints 17 oz. of fluid withdrawn. He had now been tapped eight times in four months, and he was so much better in himself that I decided to let him walk about. He was therefore discharged, being told to return to the hospital in a fortnight. He, however, returned in twelve days ; there was now slight swelling of the feet and legs. The urine (specific gravity 1020) contained a considerable quantity of albumin, but no blood.

All went on well till January 4, 1900, when he complained of very severe abdominal pain, and only passed 10 oz. of urine, which contained a considerable quantity of blood. I ordered him to drink freely of distilled water, with the result that on the following day 45 oz. of urine containing much blood was passed, and five days later, the fluid having again accumulated, I tapped him once more, withdrawing 27 pints 15 oz. The following day the urine contained no blood. A few days later he again had severe colicky pains, which were relieved by rhubarb and soda.

On January 30, 19 pints 15 oz., and on February 20, 30 pints 5 oz. of fluid were removed, and two days later he was again discharged. He continued to come to the hospital from time to time for paracentesis to be performed, and was finally discharged December 21, 1900. Since this date he has had good health and followed his occupation of a gardener, working from 6 in the morning till 5 in the evening, and during these seven and a half years he has not once been ill. I have on several occasions asked him to come and see me at the Royal Berkshire

Hospital, and on these occasions the urine was of a specific gravity varying from 1004 to 1010, with a trace of albumin. The lower border of the liver can be palpated; it is hard and quite smooth. There are no enlarged veins over the abdomen and the spleen is not enlarged.

DISCUSSION.

Dr. PARKES WEBER thought that a chronic localized peritonitis was present, probably around the liver, possibly around the spleen also. The liver was now considerably enlarged. Probably the perihepatitis was not enough to constitute a typical *Zuckergussleber*. The ascites disappeared in some of these cases with localized peritonitis after repeated tapping, and might remain absent permanently.

Dr. HAWKINS, in reply, said that he did not think that in his case the liver and spleen were enclosed in thickened capsules. He had met with such a case in which repeated paracentesis was required.

Œdema of Hands and Feet with Mediastinal Affection.

By F. PARKES WEBER, M.D.

F., AGED 21. The patient, an unmarried woman, was admitted into the German Hospital on March 23, 1908, with great œdematous swelling and cyanosis of the hands and feet. The œdema was symmetrical; in the lower extremities it extended upwards as far as the knees, and in the upper extremities to about the middle of the forearms, but the upper limit was not sharply defined in either extremities. The swelling had commenced to appear gradually in the feet about five or six weeks, and in the hands about three weeks before admission. There was no œdema of the face or loins, or elsewhere in the body. The patient said that she had previously enjoyed good health and was not aware of having anything else the matter with her. Examination of the thorax, however, showed dulness, with diminished breath sounds and voice sounds, over the lower part of the left anterior and axillary regions, up to the second rib in front and up to the sixth rib in the middle axillary line. The upper part of the dull area was separated by about $\frac{1}{2}$ in. from the left border of the sternum. There was some impairment of resonance over the left infrascapular region. Vocal vibrations could be felt over the right front, but not over the left front. There were no pulmonary adventitious sounds anywhere. The upper part of the left lung and the

whole of the right lung appeared normal. The apex beat of the heart was in the normal situation, but the cardiac dulness extended rather too far to the right; there was no evidence of valvular disease. Röntgen ray examination showed an extensive shadow on the left side of the thorax, which corresponded to the abnormal area of dulness, and was separated by a fairly sharply defined, dome-shaped border from an upper normally clear area. The heart shadow, which was not separated from the abnormal shadow, extended rather too far to the right of the sternum. Nothing of pathological significance was found by examination of the abdominal viscera and urine. Menstruation was regular. There was slight anæmia. The blood-count gave 4,150,000 red cells and 8,470 white cells to the cubic millimetre of blood; hæmogoblin (by Haldane's method), 80 per cent.; coagulation time (by Sir A. E. Wright's coagulometer), eight minutes. The microscopic examination of blood-films showed nothing abnormal. The superficial lymphatic glands were not enlarged. The thyroid gland was apparently of natural size. There was no paralysis of either vocal cord. The pupils were equal and reacted naturally to light and accommodation. Knee-jerks, very active, of the "trepidation" or "vibratory" type. No ankle-clonus. Plantar reflexes not obtained. The radial pulse, usually about 100 to the minute, was regular and equal on the two sides, and of low pressure. Brachial blood-pressure (Riva Rocci method), 95 mm. Hg. in each arm. Ophthalmoscopic examination showed nothing abnormal. Calmette's ophthalmoreaction (1 per cent. tuberculin) gave a positive result, as also did von Pirquet's cuti-reaction. The temperature varied between 99° F. and 101° F. (mostly about 100° F.). There was no cough or expectoration, or history of hæmoptysis. Respiration, 30 to the minute. There had been no pain anywhere except a little when the feet were greatly swollen and the skin very much stretched. The swelling, and especially the cyanosis, of the extremities had greatly diminished on rest in bed.

Hæmangiectatic Hypertrophy of the Foot, possibly of Spinal Origin.

By F. PARKES WEBER, M.D.

C. F. P., AGED 19. The left foot is decidedly larger than the right, and of a red or bluish red colour, as if turgid with blood. The skin over part of the foot is closely studded with small venous loops (varices), and

in a lesser degree the skin over the knee-cap. The calf muscles and other muscles of the leg are about equally developed on the two sides, but there is considerable wasting of the left thigh and buttock, and the left hip-joint is ankylosed. The pulsation in the dorsalis pedis artery is well felt in both feet. There is no anæsthesia, and the reaction of the muscles to galvanism is normal. There is considerable kyphosis in the dorsal region of the spine. There is no evidence of any disease elsewhere in the body. Radiograms show that the hypertrophy of the left foot is practically confined to the soft parts and that there is bony ankylosis of the left hip-joint (of doubtful origin). The history is that about two years ago the patient complained of pain in the back of the left thigh. He was at first treated for sciatica, and was afterwards supposed to have hip disease and wore a Thomas's splint for eighteen months. The hæmangiectatic hypertrophy of the left foot and the wasting of the thigh muscles, &c., have developed during the past two years, but the kyphosis of the dorsal region existed to some extent previously, though it seems to have increased during the last two years.

Myxædema with Optic Atrophy.

By NORMAN MOORE, M.D.

A MAN, aged 44, who was admitted to St. Bartholomew's Hospital on February 7, 1908, suffering from blindness and lethargy. He was first conscious of defective sight in his left eye in September, 1906, and in his right eye in June, 1907. He is a waiter, and realized his defect of sight one day when he swept all the glasses off a table with the crumbs. His sight was a little better in the summer. He was, on admission, very drowsy and usually did not answer questions till after a long interval, but now and then became so talkative that it was difficult to stop his flow of conversation. His eyes were kept half open or shut. The thyroid gland could just be felt. Complexion pale; skin dry and thick all over, looking oedematous, but without pitting on pressure; mucous membrane of mouth thickened; fingers thick, tremor of hands; temperature subnormal or normal; knee-jerks exaggerated, ankle-clonus present. Optic discs both show atrophy, the left much more than the right. Visual field not markedly contracted, but slightly so on nasal side. He can perceive light with his left eye and can count objects with his right.

After continued administration of thyroid extract his lethargy and abnormal mental state have disappeared, and he can walk well and

has no tremor of his hands. He speaks of his left eye as blind, but can use the right better. The discs show no change.

DISCUSSION.

The PRESIDENT asked whether, in Dr. Moore's opinion, the administration of thyroid extract had made any difference to the condition of the optic nerves.

Dr. PARKES WEBER asked whether Dr. Moore had, as far as possible, excluded all the other causes of optic atrophy. The patient looked very anæmic, and he understood he had been for a long time on thyroid extract. He thought there must be some general condition other than myxœdema to which the optic atrophy was due.

Dr. NORMAN MOORE, in reply, said that he would like to know more particularly from Dr. Parkes Weber what the causes of optic atrophy were. He had, of course, endeavoured to exclude the probable and common causes. In reply to the President, he said that the thyroid extract had made no difference to the condition of the optic nerves.

Spurious Acromegaly in a Patient suffering from Exophthalmic Goitre, associated with a Congenitally High Forehead.

By DAVID WALSH, M.D.

F., AGED 35. For five years the patient has been under treatment for recurrent patches of alopecia areata of scalp. After a severe mental shock at Christmas, 1907, the patient developed symptoms of exophthalmic goitre. The face is suggestive of acromegaly, but the appearances are similar in a photograph taken eighteen years ago. The patient has a congenitally high forehead, a condition present in every one of a consecutive series of thirty-five cases of exophthalmic goitre. This congenital sign may be described as a band of baldness or semi-baldness of variable width stretching across the frontal region of the scalp, with a further triangular area or bay projecting backwards at each end. Sometimes the band is outlined by a thin pencil of hair showing where the hair should have reached in normal conditions of growth. It is suggested that this congenitally high forehead is connected with a peculiar temperament—"potential exophthalmic goitre"—and in several cases exophthalmic goitre has actually developed under observation. As regards the resemblance to acromegaly, the features may perhaps be of a reversionary type.

Case to show the Result of Operative Treatment for Chronic Bilateral Empyema of the Frontal, Ethmoidal and Sphenoidal Sinuses.

By HERBERT TILLEY, F.R.C.S.

M., AGED 35, suffered for two years from a profuse, purulent, offensive discharge from both nostrils, associated with a feeling of "tension" in the lower central region of the forehead.

It was ascertained upon examination that pus was being discharged from all the sinuses, and radical operations had been performed upon the antra only in May, 1907, by another surgeon. The discharge continued freely from the higher sinuses, and when it was found that free irrigation failed to check the flow, radical operations upon the fronto-ethmoidal and sphenoidal sinuses were carried out.

February 12: Killian's radical operation was performed on the right side, and the sphenoidal sinus was also opened.

March 4: An incomplete Killian's operation was carried out on the left side.

The size and disposition of the sinuses before the operation are well shown by the skiagram (exhibited).

The case is shown to illustrate the superiority of Killian's complete operation to any other in extensive suppurative disease of the upper sinuses. It will be noticed that there is an almost entire absence of deformity over the right sinus; there is slight deformity over the left, where an incomplete, but otherwise successful, operation has been performed.

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An Appliance for obtaining Extension of the Spine in the Treatment of Scoliosis and Caries.

By T. H. OPENSHAW, C.M.G., M.S.

THE appliance consists of a bed made of plaster of Paris, which is accurately moulded to the whole dorsal surface of the patient, from the head to the heels. It fits with the utmost accuracy, with the result that the patient can lie on the back during the whole night or twenty-four hours without the slightest discomfort. It is specially fitted with an

arrangement of pulleys, weights and a Glisson's sling, in order to extend the spine. Counter-extension is obtained by means of a leather pelvic girdle, which is attached by straps to the iron framework of the plaster bed. This pelvic girdle is accurately moulded to the iliac crests and pelvis, thus obviating pressure sores. There is also attached to the middle line of the plaster bed, at a point corresponding with the centre or most prominent part of the dorsal convexity or hump, a broad band of webbing which passes laterally across the convexity and is attached to a horizontal iron bar fixed in the plaster bed. The convex ribs rest upon this band of webbing, and are consequently continuously subjected to considerable pressure in an anterior direction. The influence of such pressure upon the dorsal convexity is enhanced by the recumbency of the patient and by the simultaneous extension of the vertebral column.

*REPORT ON DR. ESSEX WYNTER'S CASE OF CYANOTIC
ANÆMIA.¹*

THE committee has had the opportunity, thanks to the kindness of Dr. Essex Wynter, of examining further the patient, her blood and the records of the case. The notes taken during her stay in St. Mary's Hospital have also been referred to.

In 1895 the patient presented herself at St. Mary's Hospital, cyanosed and anæmic, with indications of slight jaundice. She gave a history of having had these same symptoms for two years previously, her illness being dated from mental and bodily strain in nursing her mother. At that time the red corpuscles numbered 4,000,000 per cubic millimetre and the hæmoglobin value was 50 per cent. In 1896 the red count fell to 2,500,000 for a time. The diagnosis was thought to lie between Addison's disease and some form of aniline poisoning, but the former diagnosis was considered the more probable, in view of the peculiar tint of the skin and the fainting attacks and vomiting which were at that time prominent symptoms.

Throughout her illness she has had continuous slight pyrexia, with occasional bursts of high temperature, some of which have followed the administration of suprarenal extract. The only additional point brought out by the further examination of the patient was a distinct enlargement

¹ Shown on December 13, 1907. See *Proc. Roy. Soc. Med.*, i., No. 3., Clin. Sec., p. 48.

of the spleen, which reached to about two fingers' breadth below the costal margin.

Further examination of the blood showed no evidence of active hæmolysis, the serum was untinted, the red cells were well formed, and there were no nucleated red cells. Spectroscopic examination of the blood, diluted with distilled water, showed, in addition to the bands of oxyhæmoglobin, a narrow band in the red, which on measurement was found to occupy the position of the corresponding band of sulphæmoglobin (namely, from λ 610 to λ 625) as distinguished from that of methæmoglobin (λ 620 to λ 645).

The band in red was not removed by a *small* addition of ammonium sulphide, but only by such an excess as destroys the band of sulph- as well as that of methæmoglobin. With carbon monoxide the band in red was shifted towards the D line, and the oxyhæmoglobin bands were also shifted. This important test for sulphæmoglobin was described by S. West and Wood Clarke.¹

The urine had a brownish tint. It showed no spectroscopic absorption bands, and no nitrites could be detected in it by the meta-phenylenediamine test, which was checked by the addition of a trace of nitrite to a second specimen.

The further examination of the blood was carried out because it is only by exact spectroscopic measurements or by comparison of spectra that a sure distinction can be made between methæmoglobin and sulphæmoglobin.

We conclude that the case in question is one of intracorpuseular sulphæmoglobinæmia. The obstinate constipation, which is a conspicuous feature of the case, appears to be an important symptom of that condition, whereas enterogenous methæmoglobinæmia is usually associated with diarrhœa.

W. ESSEX WYNTER.

J. H. DRYSDALE.

F. JOHN POYNTON.

ARCHIBALD E. GARROD.

¹ *Med.-Chir. Trans.*, 1907. vol. **xc**.

Clinical Section.

May 8, 1908.

Sir THOMAS BARLOW, Bt., K.C.V.O., President of the Section, in the Chair.

A Case of Arterio-venous Anastomosis for Senile Gangrene.

By C. A. BALLANCE, M.V.O., M.S.

MRS. P., aged 75, was admitted to St. Thomas's Hospital on September 20, 1907, with arterial gangrene of the toes of the right foot. Patient said that she dropped a fender on the right foot five years previously and had subsequently felt pain from time to time in the right leg and foot. Three weeks before admission the pain settled in the toes of the right foot and the second toe became blue.

On admission the first, second and third toes were blue black in their distal halves, and the fourth and fifth toes also were somewhat discoloured. Patient complained of much pain in the foot, but no pain was felt above the popliteal space. The fingers of the left hand were bluish in colour and somewhat tender. The urine contained no sugar and only a very slight trace of albumin; the specific gravity was 1009. All the palpable arteries were thick-walled and the pulsation in them was feeble. The arteries of the right foot could not be felt. The right femoral could be felt beating at the apex of Scarpa's triangle. The toes were powdered with boric acid and covered up with cotton wool.

During the next three weeks the local gangrene appeared to be stationary, but the patient suffered a good deal of pain, for which sedatives were required. The gangrene then began to extend; the toes, especially the first three, became black and their whole surface was affected. The discoloration of the skin advanced over the dorsum of the foot, and the discoloured area was insensitive to light touches. (See Plate, fig. 1.)

It was explained to the patient that either immediate amputation must be done or a less severe operation first attempted in the hope of saving the limb. She chose the latter alternative.

Operation.—October 17, 1907: Dr. Mennell gave chloroform by the Vernon Harcourt apparatus, spinal anæsthesia being considered inadvisable. The gangrenous toes, foot and leg were bandaged in wool, and indeed the whole body of the patient except the operation area was so encased. The right lower limb was everted and the knee flexed and supported on a sandbag. An incision 6 in. long was made on the inner side of the thigh from the apex of Scarpa's triangle downwards over Hunter's canal. The sartorius was displaced inwards and the long saphenous nerve and the nerve to the vastus internus were drawn outwards. The artery and vein were next isolated from one another, and one venous and two arterial branches were tied.

The vein appeared to be unusually small, but this was because it was not distended with blood. The sheath of the artery was adherent and somewhat difficult to remove. On the middle of the exposed artery was a yellow patch of atheroma. The plan of operation was to draw the divided end of the vein like a sleeve over the divided end of the artery. As the patient had never had any pain in the thigh, it did not occur to me that the artery might be thrombosed at the site of operation. Without further examination of the artery I proceeded with the operation. The lower end of the exposed portion of the vein was clamped and the upper end ligatured and divided on the distal side of the ligature. At the upper end of the incision the artery was clamped where it was visibly pulsating; at the lower end the artery was tied and divided proximal to the ligature. The artery was of the same size throughout the whole length of the wound. The clamps used were Crile's artery clamps. There was a good deal of retraction of both artery and vein, but the ends overlapped for about $1\frac{1}{2}$ in. On cutting through the artery I was surprised to find in it a partly organized thrombus, but this thrombus I was able to remove with a fine curette. I slit up the artery bit by bit hoping to come upon a portion in which the intima was normal, but at least 2 in. of artery had to be removed before fairly healthy intima was reached. Thus it became impossible to pass the vein like a sleeve over the end of the artery, and the only method of anastomosis possible was end-to-end suture under tension, because there was now a gap of about $\frac{3}{4}$ in. between the ends of the vessels. The end-to-end anastomosis was accomplished by using eight 0 silk and No. 20 straight needles. On releasing the clamps the veins did not fill up with

blood. On careful palpation I thought I could feel a small thrombus just above the anastomosis. I made a longitudinal incision in the artery and removed the bit of thrombus, which I supposed had been displaced upwards by the curette at an earlier stage of the operation. The incision in the artery was then closed by a few interrupted stitches and the clamps again taken off. There was no bleeding from the anastomosis, but there was a small leak from the longitudinal incision in the artery. Two more stitches stopped the leak entirely. The incision should have been made in the transverse direction, for when blood fills an artery a transverse incision appears as a slit, while a longitudinal one appears as a round or oval hole, the reason being that the transverse tension in a cylindrical vessel is twice the longitudinal. There was no leakage from the anastomosis or from the incision in the artery, so attention was directed to the vein, which, though filled with blood, was not pulsating. About 1 in. below the anastomosis a small venous tributary had been ligatured; this ligature was removed and a probe passed up through the venule into the vein and thence, through the anastomosis, into the artery. On withdrawing the probe the vein at once filled up to a size larger than that of the artery and began to pulsate to an equal extent. Another striking event occurred as the artery and vein became distended with blood—they lengthened; the vessels formed an S-shaped curve, and my anxiety about the tension at the site of the anastomosis was at once allayed.

During the operation the parts were kept moist by a constant stream of sterilized salt solution and the sutures were anointed with sterilized paraffin. The sartorius was sutured in position and the wound closed in the usual way. I was given excellent assistance during the operation by my house surgeon, Mr. Unwin. I am much indebted to Mr. Thorburn, dresser, for the beautiful drawings of the gangrenous foot (Plate).

Mr. Adams, the resident surgeon, reported the condition at 9 p.m. on the night of the operation: "There was full pulsation to be felt in Scarpa's triangle, but below the site of operation no pulsation could be felt in the thigh or the popliteal space; neither could the tibial arteries be felt pulsating at the ankle. In the veins, however, there was abundant evidence of the passage of arterial blood, for in the middle of the leg the internal saphenous vein in its usual situation, $\frac{1}{2}$ in. behind the inner border of the tibia, could be felt pulsating, and arterial pulsation, synchronous with that in other parts of the body, could be both seen and felt in the dilated veins visible on the dorsum of the foot. These veins no longer conveyed venous blood, since pressure on the cardiac side of

any particular trunk caused it to collapse and stopped the visible pulsation; while pressure on the distal side caused it to dilate and increased the visible pulsation. There is no doubt, therefore, that at least the superficial veins on the distal side of the anastomosis were functioning as arteries."

Mr. Adams made later the following note: "This state of affairs did not persist; after two days the pulse in the internal saphenous was barely palpable, and though the dorsal veins of the foot remained dilated there was very little pulsation to be seen in them, and the effects of proximal and distal pressure approximated to those of pressure on normal veins. The dorsal veins were less collapsible than normal and rather seemed to contain stagnant blood, though there was no evidence of thrombosis or phlebitis. They gradually became less prominent and in a few days had entirely ceased to pulsate. At no time after the operation was any pulsation felt in the tibial or peroneal arteries."

The immediate effects of the operation were striking; arterial blood was transmitted by way of the veins to the foot, the warmth of the foot was increased, the advance of the gangrene (obvious before the operation) was stayed, a definite line of demarcation appeared on the inner three toes, and the skin proximal to the line of demarcation again became sensitive, so that light touches were readily located. (*See Plate, fig. 2.*)

During the succeeding weeks the very cold weather tried the patient much, and the left hand and the left foot became at times blue and painful, but though pain was occasionally felt in the right foot, especially in the early morning, it was less severe than before the operation, and the patient slept well all night without sedatives. On February 14, 1908, the patient suddenly suffered acute pain in the abdomen, soon followed by sickness and distension. She died the next day. At the time of her death the black areas on the toes were separating, granulation tissue appearing underneath the hard, black scabs, and though during the cold weather a blue black patch appeared on the plantar aspect of the little toe it may be affirmed that from the time of the operation the gangrene of the right foot was arrested. (*See Plate, fig. 3.*)

Autopsy.—The inner half of the cæcum and the whole ascending and transverse colon were greenish black in colour. A careful dissection failed to discover any thrombosis in the main mesenteric vessels. The anastomosis between the femoral artery and vein was closed by scar tissue, which extended into the vessels above and below it for about $1\frac{1}{2}$ in.



FIG. 1.
 Drawing of foot made on the morning of
 the day of operation, October 17, 1907.



FIG. 2.
 Appearance of foot on October 20, 1907.

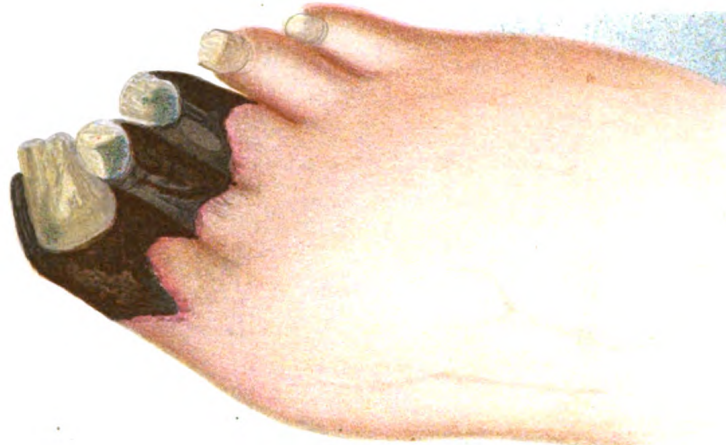
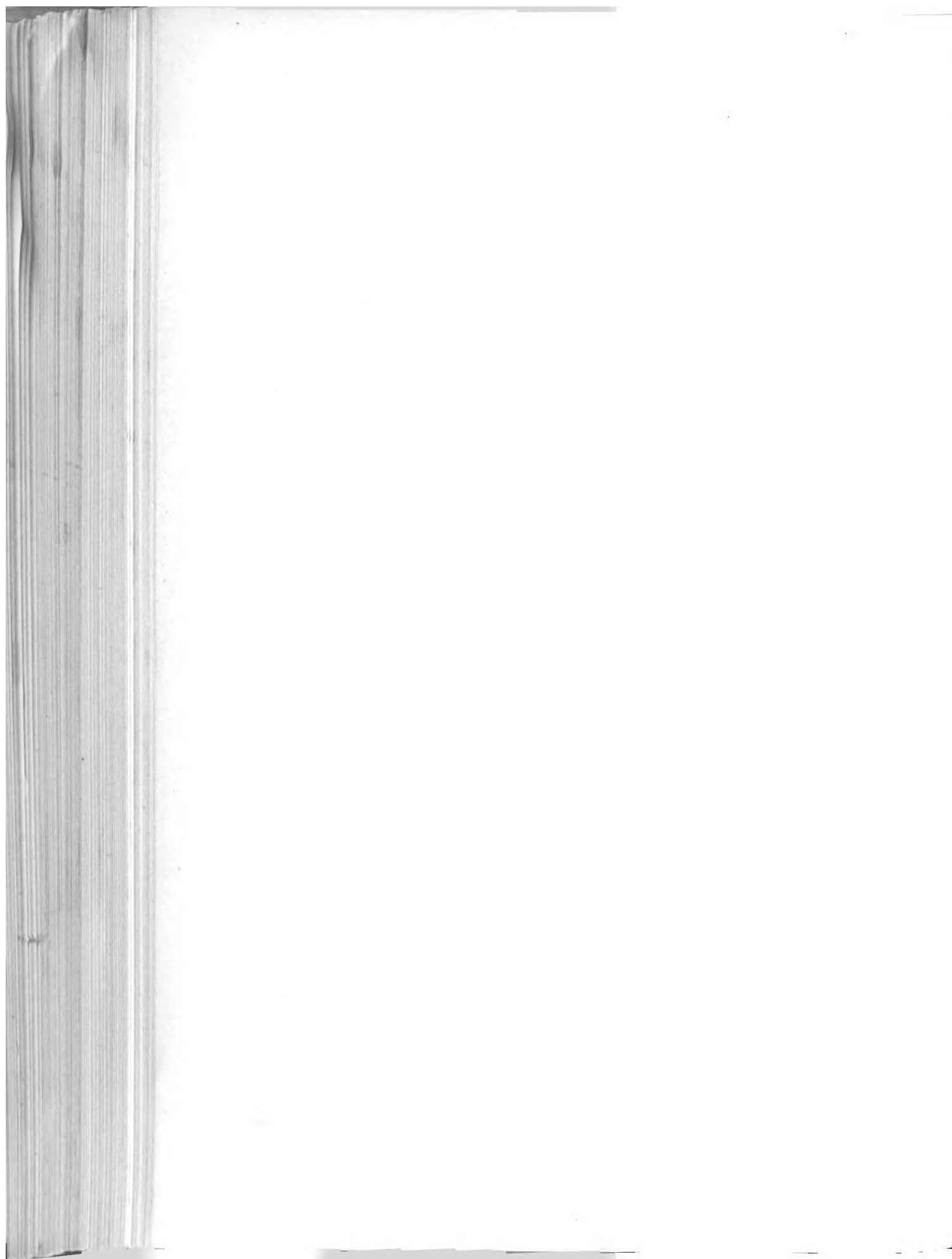


FIG. 3.
 Appearance of foot at the time of death,
 February 15, 1908.

BALLANCE: A Case of Arterio-venous Anastomosis for Senile Gangrene.



REMARKS.

The experimental study of the suture of arteries and veins during the last few years is one of the most fascinating of the many stories in the history of surgical progress. This work and clinical suggestion have opened up many possibilities of successful conservative surgery where formerly nothing lay before the patient and the surgeon but a vista of mutilation or of death.

It is now known (1) that wounds of the heart and of the arteries and veins may be sutured; (2) that a thrombus or embolus may be removed by incision of the arterial wall; (3) that portions of arteries and veins may be transplanted; (4) that a portion of vein may be inserted between the cut and separated ends of a divided artery, and that this portion of vein has a strong tendency to reconstitute the artery, assuming the anatomical characters and performing the function of an artery; (5) that the venous system of a limb may be made to carry red blood when the arterial system is obstructed; (6) that an anastomosis may be made between the portal and systemic veins; (7) that varicose veins of the leg may be treated by anastomosis of the saphena vein with the femoral vein in the middle of the thigh so that the blood of the saphena enters the femoral below the valves; (8) that organs such as the kidney and ovary may be transplanted; (9) that in certain cases an aneurysm may, as has been brilliantly demonstrated by Matas,¹ be treated by a new and striking method, not by occlusion but by reconstitution of the artery from which

¹ An attempt to close a traumatic aneurysm with restoration of the function of the artery was made by an English surgeon 150 years ago, and was apparently successful. The following is the published account of the case: "A case of aneurysm from bleeding occurred and fell to the lot of Mr. Hallowell. I recommended the method that I have hinted at. He put it in execution on June 15, 1759. Everything was done in the usual method till the artery was laid bare and its wound discovered, and the tourniquet was now slackened; the gush of blood *per saltum* showed that there was no deception. Next two ligatures, one above the orifice and one below, were passed under the artery that they might be ready to be tied at any time in case the method proposed should fail. Then a small steel pin, rather more than $\frac{1}{4}$ in. long, was passed through the two lips of the wound in the artery and secured by twisting a thread round it as in the hare-lip operation. This was found to stop the bleeding, upon which the arm was bound up, the patient put to bed and ordered to be kept quiet, &c., as usual in such cases. The wound was dressed on the fourth day, viz., June 18; it looked well for the time and continued to heal without interruption in a kindly manner. The pin came away with the dressings on June 29, that is on the fourteenth day, and on July 7 every part of the wound was healed except what was kept open by the two ligatures, which remained loose in the flesh like two setons; these were therefore removed. A few days after this the wound was completely cicatrized and on July 19 patient was discharged from the hospital perfectly well and with the pulse in the arm nearly as strong as in the other."—Lambert, of Newcastle, in a letter to Hunter published in *Medical Observations and Enquiries*, 1762, ii., p. 360.

it arises, or the blood-stream may be diverted from the aneurysm, as was done in 1906 by José Goyanes, by arterio-venous anastomosis, an operation which might not only cure the aneurysm but prevent or arrest gangrene.

The experiments of Carrel, Jensen, and Watts show that end-to-end anastomosis of arteries and veins is best performed by simple suture, a fact which has long been established with regard to suture of the intestine. The extra-vasal magnesium rings of Payr, the glass cylinders of Abbé and Gluck; the endo-vasal caromel cylinders of Carrel and the glass bobbins of de Gaetano have now only an historical interest, like Senn's plates and other mechanical aids to intestinal anastomosis.

Further, the experiments show that the intima may be included in the suture with impunity, the application of the suture being thus greatly facilitated, just as the suture may perforate with impunity the mucosa in intestinal surgery, as we have recently learned. In intestinal suture the threads, even when inserted by Lembert's method, gradually become free in the lumen of the bowel, but those applied for vasal suture remain in situ, as the interior of a blood-vessel, unlike that of the intestine, is aseptic and not outside the body.

Arterio-venous anastomosis was first successfully performed by Gluck, who writes: "I have succeeded in anastomosing the arteria carotis with the vena jugularis of the dog by means of a circular suture without any thrombosis; it was interesting to observe how there was at first a sort of whirlpool between the opposing streams of blood in the artery and vein, when the arterial blood flowed in a pulsating stream through the smaller channel of the artery into the wider vein. After a minute or two the arterial blood-stream flowed with regular pulsation through the vein and maintained its superior force and regularity." The length of time the animal lived after the operation is not mentioned.

Carrel and Morel, in 1902, successfully carried out the same operation and showed the dog several weeks afterwards at the Société Nationale de Médecine.

Following upon these experimental results an attempt was made to treat arterial gangrene in man by lateral anastomosis of the femoral artery and vein. San Martín y Satrustegui operated upon two patients, both men, one aged 52 and the other aged 66; and Jaboulay published one case, that of a man, aged 47. All these cases were unsuccessful.

Carrel and Guthrie maintain that lateral anastomosis fails because (1) a very large proportion of the red blood returns at once to the heart

through the central end of the vein ; (2) the peripheral portion of the vein and its branches pulsate, but the valves are not forced and the red blood does not circulate through them.

Hubbard, of Boston, Mass., published in 1906 the case of a man, aged 80, in whom he did end-to-end arterio-venous anastomosis at the apex of Scarpa's triangle for senile gangrene of the right foot. The vein below the anastomosis never filled up properly and only partially pulsated. The superficial veins never pulsated, the gangrene spread and amputation was performed.

Torrance, of Birmingham (Alabama), made an end-to-end arterio-venous anastomosis between the anterior tibial artery and the saphenous vein in a case of compound fracture with injury to the artery, but the anastomosis sloughed.

Mr. Adams, the resident surgeon at St. Thomas's Hospital, and the writer performed some experiments on the cadaver with a view of determining how far fluid of the same specific gravity as the blood could be made to traverse the lower limb under normal or more than normal pressure through the veins. An injection into the femoral vein at the apex of Scarpa's triangle appeared immediately in the inferior vena cava and azygos veins, and did not descend the limb further than the popliteal space. An injection into the femoral vein in Hunter's canal only reached the middle of the leg. These experiments confirm those of Gallois and Pinatelle, who found that the valves formed an insuperable obstacle, and they came, therefore, to the opinion that arterio-venous anastomosis was not a justifiable operation in man.

Carrel and Guthrie, however, while admitting that though logically the reversal of the circulation is impossible, have shown that the living tissues have a strong power of adaptation, and by a series of beautiful experiments have proved that it is possible. They watched the red blood forcing the valves of the veins ; in two hours all the valves in the saphenous vein were forced and in three hours the reversal of the circulation was complete.

It will be noted that, in the writer's case, the thrombus, which was the immediate cause of the gangrene, had blocked the femoral artery in Hunter's canal, though before the operation it was thought that the popliteal was the artery occluded. Francis Street, in a paper on arteriotomy for thrombosis and embolism, remarks on the inability which is sometimes encountered to locate definitely the obstruction by the mere symptoms. He points out that the symptoms are caused, not by the thrombus itself, but by the result of the arterial obliteration ; "the pain

is referred to the area from which the blood is excluded, not to the seat of obstruction."

The arterio-venous anastomosis in my case could have had no effect in increasing the arterial obstruction in the vessels of the limb, since the artery was thrombosed at the site of the anastomosis. How long the anastomosis remained patent it is impossible to guess. It may have been occluded in three days or it may have been patent for a time longer or shorter than three days. The fact remains that it had an immediate and remarkable effect on the gangrenous process, and if it had been permanently patent it cannot be doubted that a still more striking result would have been attained. The result would appear to justify the hope that we are in sight of a method which will replace, in certain cases, the necessity for amputation in senile gangrene, and of a method which may be applied to the relief of those distressing cases of endarteritis obliterans in the limbs of young people which are sometimes observed.

There is no doubt that the operation of arterio-venous anastomosis is not an easy one and that it requires practice and manipulative dexterity. Edwin Sweet writes: "Now this seems very easy, and in truth it is not very difficult, except for the extreme delicacy of the needles and the silk and the vessel walls; it is unusual surgery, since it partakes of the art of the watchmaker. Why, then, cannot everyone succeed in performing these simple though delicate operations? Why do we read reports varying between absolute failure and uniform success?"

Stephen Watts observes: "I wish also to emphasize the point, for I consider infection by far the most important factor in producing thrombosis after vascular sutures. I think, as Carrel does, that there may be minor modes of infection which, although allowing of *per primam* healing of the wound, may be sufficient to produce thrombosis of the sutured vessels."

But Edwin Sweet's comment seems to me most apposite: "That some coagulation occurs in every case seems to be proven by the statement that slight hæmorrhage is to be controlled by gentle digital compression. Such a method could only stop hæmorrhage, it seems to me, by favouring the filling of the needle holes by coagulum. I think, therefore, that those who report uniformly successful results have succeeded, not because they enjoy a monopoly of aseptic technique, but of mechanical technique."

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- (1) Arteries which have been completely divided transversely may be made to unite by the method of suture we employed (fixation threads and continuous suture) without special difficulty, and, provided the workmanship is good and the course of the wound aseptic, with every prospect of complete restoration of function. The method succeeds with both large and small arteries.
 - (2) Portions of arteries may be resected and a segment of an artery from the same individual or from an animal of the same species may be put in its place.
 - (3) A portion of an artery from a recently killed animal may be put in the place of a segment of artery resected in a living animal of the same species with complete restoration of the function of the vessel.
 - (4) It is even possible to transplant a portion of artery from one animal to another of a different species.
 - (5) A segment of vein may be transplanted into a gap in an artery; the segment of vein so transplanted undergoes changes in structure so as to, in time, come to resemble an artery.

In this paper reference is made to an operation performed in 1906 by José Goyanes, who treated a popliteal aneurysm by arterio-venous anastomosis.

208 Ballance: *Arterio-venous Anastomosis for Gangrene*

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WATTS, STEPHEN. *Ann. Surg.*, Philad., 1907, xlv., p. 373, and *Johns Hopkins Hosp. Bull.*, 1907, xviii., p. 153. In this admirable paper a full bibliography, to which I am much indebted, is given.

DISCUSSION.

Mr. FORBES ROSS said he had been much interested in senile gangrene, angina cruris, and other conditions affecting the arteries of the lower limb; also in spasms affecting the hands, as in pseudo-Raynaud's and true Raynaud's disease. There was an occlusion of arteries which was physiological, but enough use had not yet been made of it. In ordinary aneurysm of the popliteal artery, in which the vessel was ligatured above and below the sac, and the aneurysm dissected out, in twenty-four hours the limb was flushed and a large volume of blood was passing through it; there was positive vasomotor dilatation. His views on the matter had been driven home by a case shown by Dr. Parkes Weber at the Neurological Section, and reinforced by one shown by proxy for Sir William Gowers. He believed that what Mr. Ballance had done simply amounted to ligature of the femoral artery. Nature was trying to occlude the artery as fast as she could. In cases where one might expect gangrene, or arterial spasm, or angina cruris it was feasible for the surgeon to operate before necrosis set in, ligaturing the vessel as low as it could be reached, and thus restoring to the patient an elastic circulation. Mr. Ballance had tried to use a very elastic vein to replace a very inelastic artery. When a blood-vessel was tied a collateral circulation was established, and the capillaries had to hypertrophy to carry it out. He, of course, did not propose to ligature the artery to produce gangrene, but to produce vasomotor dilatation, which would end in giving the patient ten arteries instead of one. Alexander Morison had shown the profession—and he worked with Dr. Morison when he did it—that all the arteries of the body were innervated by ganglia in their walls, and that when a main artery was tied, there was a disturbance of the main nerve supply of the limb, and one perhaps destroyed the whole nervous energy going down that artery. So when Mr. Ballance cut the artery he was possibly disturbing the *nervi arteriorum*, and ultimately the vein ceased to pulsate. It was evidently occluded, and therefore practically ligatured. He suggested that ligature, either deliberate or not, as low down as possible, was the correct procedure in some of the cases, thus helping Nature in what she was trying to do, viz., to get the collateral circulation to open up.

Mr. BALLANCE, in reply, said he did not think the remark of Mr. Forbes Ross was exactly apposite to his paper, as he was only dealing with arterio-venous anastomosis, not discussing other methods of treatment.

A Case of Leucodermia, which died with Symptoms of Addison's Disease, and in which Cirrhosis of the Suprarenals was found.

By NORMAN DALTON, M.D.

THE patient, Sarah C., was aged 35 at the time of her death. She was a charwoman and unmarried. There was nothing of any importance in the family or personal history. She was a teetotaler. The leucodermia had existed for ten years before the gastric symptoms set in, and she died in syncope three months later. The skin affection was diagnosed as leucodermia by several eminent dermatologists, and the photographs which are being shown, and which, by the way, were taken after death by Mr. Reid, leave no doubt that it was a genuine case. Consequently I need not describe the appearances of the skin except to say that the white patches were large, numerous and widely distributed over the body. There was one curious point, however, namely, that though the patches were quite devoid of pigment and appeared absolutely white after death, during life they had the faintest possible tinge of pink, so that she was not so much brown and white as brown and pale pink, which made her appearance even more extraordinary than is usual in such cases.

In July, 1907, she began to suffer from epigastric pain and vomiting and general weakness, for which no cause could be found. She improved during a visit to the seaside, but relapsed on her return home and became so ill that she was admitted into King's College Hospital on October 4. On examination, nothing was noted but a weak pulse of 80 to the minute, an absence of the cardiac impulse and a septic condition of the mouth from bad teeth. While in the hospital she continued to vomit in spite of all kinds of treatment. There was no blood in the ejecta, and as the taking of food temporarily relieved the sickness, I thought that there could scarcely be a gastric lesion. Tabes was easily eliminated, and, although it crossed my mind, I cannot say that I seriously thought that it was a case of Addison's disease. The temperature was normal, not subnormal. She rapidly became weaker, and on October 15, eleven

days after admission, she suddenly became deadly faint, with an imperceptible pulse, &c., and she died in a few hours.

I had seen her during the final syncope and could not fail to observe the resemblance to the manner of death in Addison's disease, so that at the post-mortem I turned my attention particularly to the adrenals. At the time these appeared quite atrophied and to consist merely of loose connective tissue, blood-vessels, and some small buff-coloured areas which might be remnants of suprarenal tissue. This is rather remarkable because, when they were hardened, they contracted and became firm and compact, so that in the specimen which I am showing they appear somewhat small, but otherwise normal. However, on microscopical examination they proved to be cirrhotic. The fibrous capsule and stroma are increased in quantity, the columnar arrangement of the cells is to a great extent lost, and the cells are arranged in lobules surrounded by fibrous tissue. In some places the fibrous tissue extends between the cells as in intercellular cirrhosis of the liver, and many of the cells are fatty or broken up. In one place the lobule is infiltrated with fresh, bright-staining leucocytes. At the post-mortem there was apparently no fibrosis around the adrenal, so that neither the semilunar ganglia nor the suprarenal veins were likely to be compressed. Consequently the ganglia were unfortunately not dissected out. There is nothing else to be noted in connection with the post-mortem.

I am anxious to put this case on record because it is extremely rare. Dermatologists state that leucodermia does not affect the general health, and this patient was quite well for ten years in spite of the skin affection. Further, it is not easy to find a record of a post-mortem on a case of leucodermia, and most of us would have been inclined to say that patients with that affection always die of some intercurrent disease. Hence it is as well to know that in rare instances symptoms of Addison's disease may supervene, with fatal results, and that lesions of the suprarenal have been found in these cases after death. My case, though rare, is not unique, for in the *Glasgow Medical Journal* for 1879 (first part) Dr. McCall Anderson describes the case of a man, aged 50, who, after suffering from asthenia with vague and varying pigmentations for some years, eventually developed definite leucodermia, together with gastric symptoms, and finally died of cardiac failure. In this case extensive degeneration of the suprarenals was found. Dr. McCall Anderson states that Dr. Greenhow had recorded a similar case, but I have not been able to find it in the latter's work on Addison's disease.

I may say that I do not think that the conjunction of leucodermia with symptoms of Addison's disease is a mere coincidence, but I have no theory of my own to explain the association. Before theorizing it would be necessary to be more certain about the pathology of uncomplicated leucodermia, and there is no time to discuss either the neurotrophic or the toxic theories. It is possible, however, that this case may be heard of again in connection with the pathology of leucodermia, for it will be observed in the picture that there is a large white patch round the eye, and I have the authority of Mr. Lenthal Cheatle for saying that he has found a chronic inflammatory condition in the corresponding Gasserian ganglion of this patient.

N.B.—The following points may be noted as showing that the pigmentary changes in the skin in this case were typical of those seen in leucodermia, and distinct from those seen in Addison's disease. The white patches were sharply demarcated from the dark, and they were situated in areas supplied by certain cutaneous nerves, notably on the face, where the areas supplied by certain branches of the supra-orbital nerve were quite white. The white patches were devoid of pigment, and the only point in them which suggested anything not quite typical of leucodermia was the faint pink blush to which I have alluded in my paper. The dark patches were darker than the skin of Europeans. There was nothing in the history or the appearances to suggest that the white patches were areas which had escaped the pigmentation of Addison's disease. The patient did say that she first thought that she had freckles, but this is, I am told, not infrequent in leucodermia, as the white patches do not attract the patient's attention. No change occurred in the skin during the last few months of life, *i.e.*, no increase in the white or dark areas. There was a localized patch of white hair on the pubes, such as is very typical of leucodermia. When the case was admitted to the wards I asked Dr. Arthur Whitfield, physician to the Dermatological Department in King's College Hospital, to see it in consultation with me. He then confirmed my opinion that the skin condition was typical of leucodermia, and mentioned that he had seen the case some time before in his department and had made the same diagnosis. From the other point of view it may be mentioned that there was no bronzing of the areolæ of the breasts, or the pubes, or the axilla, or the inside of the mouth. Exposed parts were also free from bronzing, the backs of the hands (as seen in the pictures exhibited) being the seat of a large white patch.

DISCUSSION.

THE PRESIDENT (Sir Thomas Barlow) mentioned that the late Dr. Leech, of Manchester, brought forward a similar case some years ago. The case was published in the *Transactions of the Pathological Society*, vol. xxx.

SIR DYCE DUCKWORTH said that it seemed clear that the condition of the suprarenal bodies in this case was very different from that commonly found in ordinary cases of Addison's disease. In the present case there seemed to be almost absolute atrophy, whereas in ordinary Addison's disease the adrenals were much enlarged and in a tuberculous condition. There were many cases in which modification of pigment had been observed in connection with changes in the suprarenal bodies, but which had not presented all the characteristic symptoms of Addison's disease. However, the present case and similar ones seemed to point to a very close relationship between the positive pigmentation or vagaries of pigmentation and the functions of the suprarenal bodies.

DR. PARKES WEBER thought that the photographs of Dr. Dalton's patient showed great general melanoderma, *i.e.*, except for the patches of pale skin. He thought that the pigmentation might be the real melanoderma of Addison's disease, which had left circumscribed areas of normal skin untouched so as to simulate the leucoderma of Vitiligo. He asked Dr. Dalton whether there was any evidence against this view, either from the results of microscopic examination of the pale and dark portions of the skin, or from clinical records as to the commencement of the pigmentary abnormality. Did the white patches commence to appear when the skin generally was normal in colour?

DR. DALTON, in reply, said that the patches had not been examined with the microscope. The diagnosis had been decided by dermatologists who saw the case during life and were satisfied as to its nature. The condition started ten years ago, and he could not say from personal observation what had been the manner of its development.

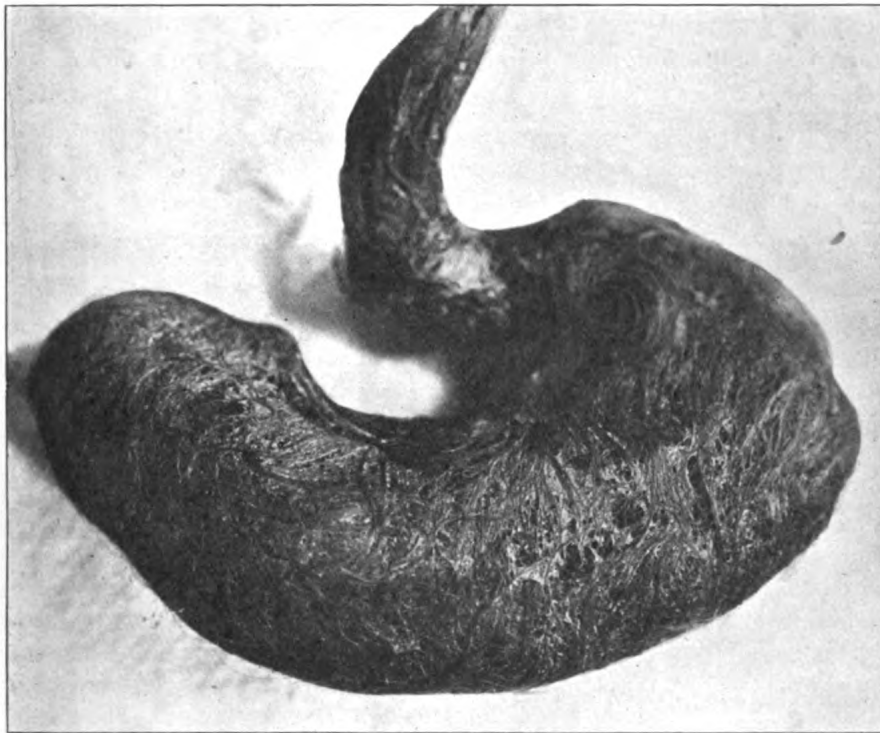
Hairball in the Stomach.

By G. F. STILL, M.D.

LUCY A., aged 9, was admitted into King's College Hospital on February 12, on account of an abdominal tumour, which had been noticed first seven months previously. The abdomen had been noticed to be large for about a year, and there had been frequent sickness almost daily for several months. The child had become more ill during the last two months. The appetite was very bad, the bowels were regular, and for the last three weeks the child had taken milk only. There had been much "pain in the pit of the stomach" for three months.

The mother stated that for several years past the child's hair dropped out during two days in June! [No importance was attached to this statement, nor, indeed, to the scantiness of the child's hair, until operation showed the nature of the tumour, when it was ascertained that the child had been in the habit of pulling out her hair and eating it since she was 3 years old.]

On admission the child was bright and intelligent, somewhat wasted and pale, but not acutely ill. There was no sign of disease except in



Hairball removed by Mr. Burghard from Dr. Still's case.

the abdomen, which was large and lax, and showed, as the child lay on her back, a slight prominence across the epigastric region, which on palpation corresponded to a very hard tumour extending from the left costal margin in the splenic region to the right nipple line, where its lower edge was at the level of the umbilicus; it was $2\frac{3}{4}$ in. wide at its thickest part, which was near its right extremity. Its upper and lower edges and its right extremity were well defined and seemed quite superficial, though

evidently inside the abdominal cavity; it was not tender, its surface was smooth; it was thought to be slightly movable up and down. Various diagnoses were suggested, including enlarged spleen (but the spleen seemed to be definable by percussion and not continuous with the tumour), lympho-sarcoma, and a tubercular infiltration. Whilst in hospital the child seemed free from pain, and vomiting was only occasional, but the child would take very little food.

It was decided to explore, and Mr. Burghard did laparotomy. The stomach was found to be dilated by a hard mass, which was evacuated through a longitudinal incision about 3 in. long, near the pyloric end of the stomach. The mass proved to be a hairball, weighing 17 oz. and measuring in its long axis 6 in., in circumference $7\frac{1}{4}$ in., and along its greater curvature $13\frac{3}{4}$ in. It had exactly the shape of the stomach, of which, indeed, it formed a solid cast; it tailed off at the cardiac orifice into a narrower tail-like portion, which must have extended quite 2 in. up the œsophagus.

DISCUSSION.

In answer to the President, Dr. STILL said that a 3 in. incision was made in the longitudinal axis of the stomach and very near the pyloric end, and even then the incision was only just large enough. The hair had formed a complete cast of the stomach, and a portion tailed off into the œsophagus.

Mr. C. A. BALLANCE said he had had a somewhat similar case, in a woman, aged 21, who was in St. Thomas's Hospital some years ago with an obvious tumour in the epigastrium. She had occasional vomiting, and an operation was done to determine the diagnosis. The stomach was found distended with a hard mass, which occupied the whole of it. He incised the stomach wall and pulled out an enormous mass of hair. It did not extend up into the œsophagus, but down into the duodenum and into the jejunum. By careful manipulation and gentle pulling he got it out from the intestines, and believed he removed all the hair from the stomach and intestines. She made an uneventful recovery, and denied that she had ever eaten any hair. He did not think that she could have eaten her own hair, as she had an abundance of it upon both sides of her head.

Dr. DALTON said that by the kindness of Dr. Still he had had an opportunity of seeing the case before the operation, and it was obvious that the condition was connected with the stomach. If the patient had been an adult, one should have thought of an enormous lympho-sarcoma, such as was sometimes found. The only point opposed to that was the extreme hardness of the tumour.

Dr. A. MASTERS said that about fifteen years ago he was called to see a girl aged 15, who had exceedingly thick hair, which was also very long. The

mother complained that she could not prevent her chewing the ends of the hair. A little plain talking seemed to put an end to the habit, and he believed that no ill results in the shape of a tumour ensued. He remembered in childhood having seen a hairball taken from a cow's stomach, wherein it had formed in consequence of the cow's habit of licking itself.

Dr. TRAVERS SMITH said the statement of Dr. Masters reminded him of a post-mortem examination which he made on a cat. Cats were very fond of biting off bits of grass and swallowing them, and he believed that they did so in order to introduce some foreign body into the stomach around which the hair which they swallowed in cleaning themselves could be wound. In the stomach of a cat which had not died of disease a whorl of hair and grass would be found. This might afford some indication for treatment.

Mr. T. SUTTON TOWNSEND remarked that lambs were very fond of picking wool off their mothers, and the swallowing of that wool and the blocking of the intestines was responsible for probably 40 per cent. of the deaths during the lambing season.

A Case of Rupture of the Upper Cord of the Brachial Plexus at Birth.

By Sir THOMAS BARLOW, Bt., K.C.V.O., M.D., and
C. A. BALLANCE, M.V.O., M.S.

A. J. WAS seen in October, 1903. He was then aged 10 months. On the day following birth, which was instrumental, the right arm was noticed to be paralysed. On examination the right upper extremity was seen to be rotated inwards, so that the palm of the hand looked backwards and outwards. The deltoid, biceps, brachialis anticus and supinator longus muscles were obviously paralysed. On palpation above the clavicle a small hard lump could be felt in the region of the upper part of the brachial plexus. A few days later the muscular reactions were tested under chloroform by Dr. Purves Stewart. The deltoid, biceps, brachialis anticus, coraco-brachialis and the supinator longus were totally paralysed and devoid of faradic excitability, except the deltoid, which had a slight flickering reaction in some of its fibres, insufficient to abduct the shoulder. The extensors of the fingers, which were somewhat feeble voluntarily, reacted well, as did also the rhomboids, latissimus dorsi, pectorals, triceps, flexors of wrist and fingers and the supra- and infra-spinati. The lesion was therefore below the place where

the nerves to the rhomboids and the spinati are given off, and was, in fact, in the most usual site of injury in birth palsies of the brachial plexus, at or just below the junction of the fifth and sixth cervical nerves (fig. 1).

**BRACHIAL PLEXUS AND SUPPOSED SITE OF LESION
BEFORE OPERATION**

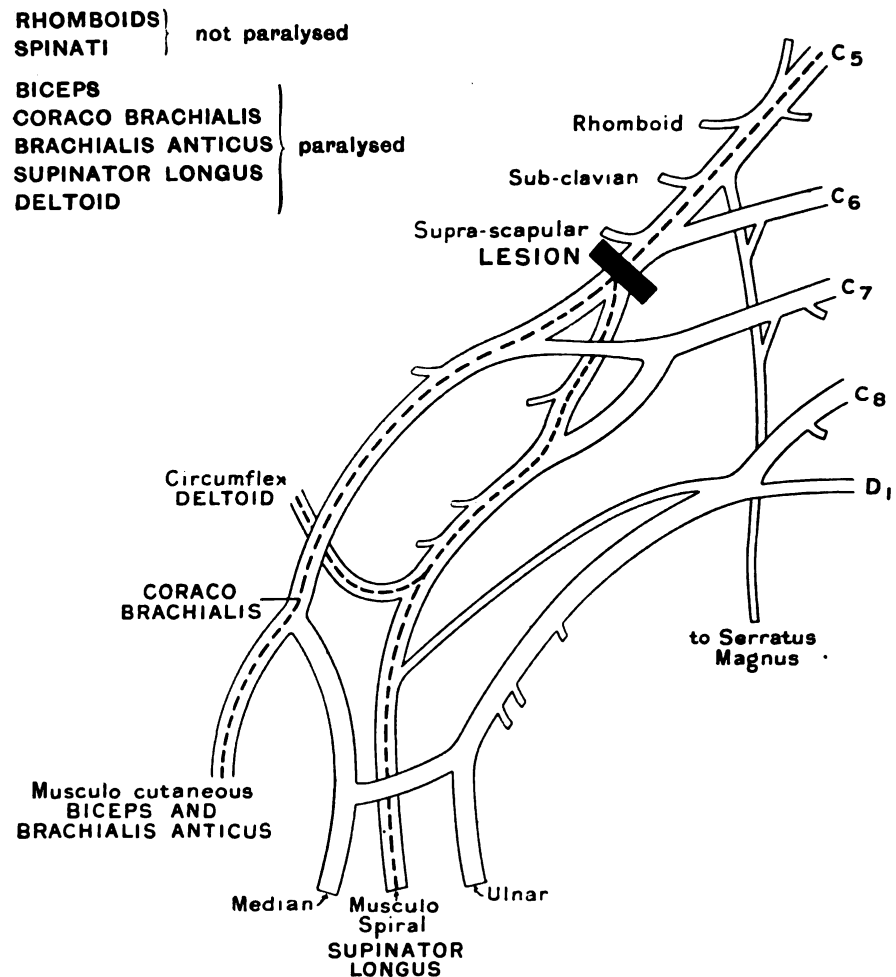


FIG. 1.

On October 29, 1903, the upper part of the brachial plexus was exposed by operation (fig. 2). The little lump felt before operation was found to be on the distal extremity of the fifth nerve, and to it the sixth

nerve was adherent. The lump was in reality the bulb on the proximal end of the ruptured nerve. There was some matting of the tissues around and below the bulb. Beyond the bulb was a small mass of scar tissue, and from this three nerves seemed to proceed. These were stimulated; the upper was the suprascapular, the next caused contraction of the deltoid and biceps, and the lowest contraction of the brachialis anticus and supinator longus. On stimulating the fifth nerve above the bulb no movement of the paralysed muscles occurred, but the spinati contracted. It was clear, therefore, that the rupture was not complete, otherwise the muscles supplied by the suprascapular nerve would have been paralysed.

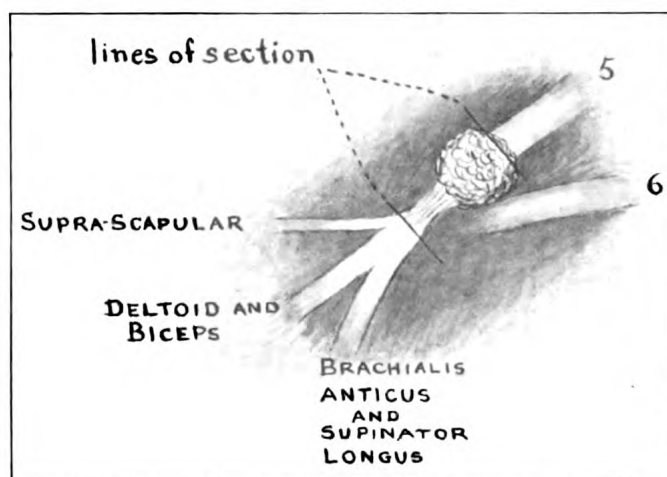


FIG. 2.

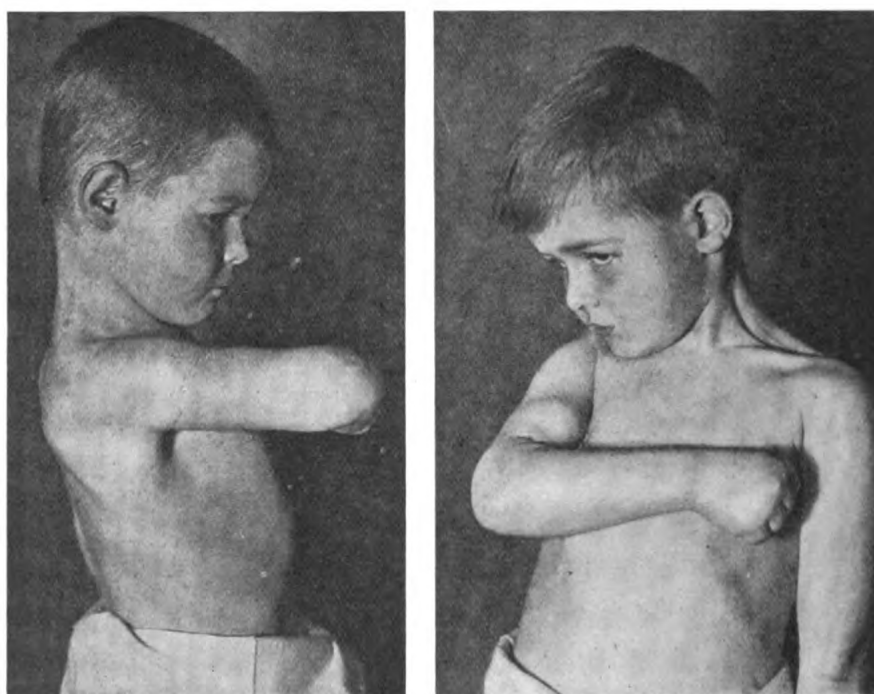
Rough sketch at operation. The sixth nerve was adherent to the bulb, but its further course was not defined.

The bulb and scar tissue were excised. The part excised measured $\frac{3}{4}$ in. The divided ends were brought together by sutures of 0000 silk—the finest needles being used. The wound healed by first intention and shortly afterwards the child was taken by its parents to Hong Kong. They were advised to have massage regularly carried out.

In October, 1907, the child, now aged nearly 5, was seen again on his return to England. Massage had been carried out in Hong Kong by a Japanese masseur. It was obvious at once that a remarkable improvement had taken place; the whole limb no longer hung uselessly

by the side, and on faradic stimulation all the muscles reacted briskly. There was still deficient movement of the shoulder as regards abduction and also some deficiency of supination, both of which conditions were in part due to adhesions in the corresponding joints. It was clear, too, that the pectoral muscles were shortened, for on raising the arm the tendon of the pectoralis major became very tight.

The slight adhesions in the shoulder and radio-humeral or radio-ulnar joints were broken down under chloroform. Since October, 1907, the



Showing extent of recovery in deltoid.

Showing extent of recovery in biceps.

FIG. 3.

Condition of muscles, April, 1908.

treatment has consisted of massage and gymnastic movements to further develop the muscles.

Present State.—Notwithstanding the strong action of the biceps, complete supination by voluntary movement is not possible, and the cause of this is not clear; the pectoralis major is still short, and whether it would be wise to lengthen its tendon or not is a debatable question.

DISCUSSION.

Dr. POYNTON remarked that the birth paralyses of children were very puzzling, and that it was difficult to know what treatment to advise. In a children's hospital considerable numbers of such cases were seen, the majority affecting the arm, which was held low and turned backwards. The difficulty was when to advise operation, and when not. The indications for operation in the present case were very clear and the operation was a magnificent success. In other cases there were no clear proofs that any one cord was torn across, but there were a number of cords more or less damaged. He had followed up many cases with such lesions, and had been surprised at the degree of recovery which was attained in some of them, even without operation. He admitted that the recovery was seldom quite complete. He would be pleased to hear more about the indications for operation in such cases, and what was considered by surgeons to be the best time for an operation.

Mr. C. H. FAGGE said his experience of such cases was limited to three, and he was much interested in hearing what Mr. Ballance said when comparing the two diagrams which he showed. The first diagram showed a lesion affecting the upper trunk of the brachial plexus; in the second diagram, representing what was seen at the operation, there was a lesion of the fifth nerve only. The second diagram confirmed what Dr. Wilfred Harris showed to be the probable anatomical nature of these lesions in the common type of brachial plexus, in which all the nerve supplies of the muscles involved came from the fifth cervical nerve. But if the second diagram was correct, he did not know why the spinati were not affected. In the first case on which he had operated it was possible to dissect out the fifth nerve from a mass of scar tissue, and although the operation was undertaken eighteen months after the injury at birth, a very fair return of power ensued. In the second case the fifth nerve was ruptured, apparently, behind the anticus, and its distal end was grafted into the seventh nerve, but the result was not satisfactory. In the third case the fifth and sixth were so damaged internally to the point which they should have reached that no operation on the trunks themselves was considered advisable. He asked whether Mr. Ballance could give any indication as to the time limit beyond which it was of little use to operate on such nerve trunks.

Mr. LOCKHART MUMMERY said that he had had several such cases, but had not operated on any of them. He had noticed that in nearly all cases of birth palsy there was a tendency for marked ankylosis to occur after a time in the shoulder, between the humerus and scapula. He regarded this as a compensatory process; he had seen one instance of marked improvement in the mobility and usefulness of the limb resulting from such ankylosis. In it there was a surprising increase of movement, without any improvement in the paralysed muscles. It occurred to him that in some of the cases in which recovery did not take place, or in which the lesion was too severe to warrant an operation, good might be done by producing ankylosis between the scapula

and the humerus at some favourable angle, by movements and massage, with the aim of encouraging the action of some of the scapular muscles.

Mr. BALLANCE, in reply, said that one question asked had related to the course of the suprascapular nerve. The reason the spinati reacted in his case was that the rupture was not complete; at any rate it did not involve the suprascapular fibres. He did not think there was any time limit for the reunion of a nerve, so long as any movements could be obtained in response to stimulation, this having sometimes to be employed in the shape of very strong currents, with the patient under chloroform.

Gross Lesion of Post-central Gyrus, associated with Astereognosis.

By PURVES STEWART, M.D.

M., AGED 50, a publican, without history of syphilis, was previously healthy. In 1894 or 1895 he began to complain of buzzing tinnitus in the right ear and occasional headaches, unilateral, but not always on the same side. In 1901 he had paroxysmal pains in the right hand and forearm for about three weeks. In 1904 the headaches became more severe, and at the end of 1905 he began to have attacks of vomiting. When first examined in 1906 he showed no evidence of aphasia nor of weakness of any limb; the optic discs were normal.

In August, 1907, he began to complain of occasional subjective sensations of tingling in the right index and middle finger and of difficulty in finding his words. He made mistakes in spelling, and his memory became impaired. On examination in September, 1907, there was weakness of the right lower face, without weakness or ataxia of the limbs on either side. The optic discs and cranial nerves were normal. The deep reflexes were normal on both sides; the plantar reflexes could not be elicited. Speech was hesitating, and in writing he made frequent mistakes of spelling, tending to miss out letters or to write the wrong letter. He could execute spoken or written commands. Shortly after this, in spite of energetic antisyphilitic treatment, the headache became more intense and was now localized to the left parietal region. The right upper limb became clumsy and slightly weak. He developed astereognosis, failing to recognize objects such as a watch-chain or a safety-pin with the right hand, and succeeding with the left. The deep reflexes were normal on the two sides in upper and lower limbs. By the middle

of October, speech had become still more impaired, with difficulty in finding words and occasional jumbling of syllables. There was no hemianopia. The right lower face was weak, and the right fingers and wrist were totally paralysed and flaccid, the elbow and shoulder being feeble. The right leg dragged slightly in walking. There was no cutaneous anæsthesia or analgesia; the supinator-jerk and knee-jerk were increased on the right side; the plantars were not elicited. The optic discs remained normal.

The astereognosis of the right hand, with the steadily progressive right hemiplegia and the intense headache, in spite of the absence of optic neuritis or vomiting, suggested a gross intracranial lesion in the region of the left post-central gyrus. He was accordingly sent to Mr. Ballance with a view to operation.

On October 28 Mr. Ballance performed the second stage of an exploratory operation in the left parietal region. The pia-arachnoid was thick and yellow over part of the left post-central gyrus, the patch of infiltration being strictly limited anteriorly by the fissure of Rolando and by the vessel coursing therein. The diseased area occupied the post-central gyrus, in its middle third and the adjacent part of its lower third. At a small distance anterior to the pre-central gyrus, over the middle frontal gyrus, there was a small stellate patch of opacity in the pia-arachnoid, not purulent as in the post-central gyrus. The diseased area of meninges and subjacent cortex in the post-central gyrus was removed.

On November 5 speech was hesitating, the patient talking in monosyllables or isolated words, not in sentences, and occasionally misplacing his syllables. He could read aloud, but did not attempt to execute written commands. He could repeat sentences spoken to him, and he understood and executed spoken commands. He could copy written sentences with his left hand, but could not write spontaneously. No cutaneous anæsthesia or analgesia was present. Distinct atopognosis to touches existed in the right hand, the touches being misjudged in a proximal direction; with pin-pricks localization was accurate. Joint-sense was normal in the right shoulder and elbow, but lost in the right wrist and fingers. Astereognosis of the right hand was as before. The external ocular movements were normal; the right lower face was weak, both on voluntary and emotional movement. The right shoulder and elbow were feebler than the left; the movements of the right wrist, especially extension, were still more feeble. The fingers were totally paralysed. There was some wasting of intrinsic hand muscles, especially the interossei, in the right hand. The right lower limb was slightly

feebler than the left and dragged a little in walking. The right supinator-jerk was markedly increased, the right knee-jerk moderately increased; there was no ankle-clonus. Plantar reflexes were both flexor in type.

On November 22 speech had begun to improve, though still "telegraphic" in style. He had been reading the sporting papers and remarked "Cricket match," "Australia," "Draw." He sang the airs of "God save the King" and "Auld Lang Syne" accurately, but confused the words. He had no word deafness. He could copy written words and write simple words to dictation. Atopognosis of the right hand was now practically gone. There was no cutaneous anæsthesia or analgesia. Joint sense was normal at shoulder and elbow, lost at wrist and fingers. Astereognosis with objects placed in right hand was present as before. There was now no absolute paralysis of any movement of the right upper limb, though all movements were feeble, especially in the fingers. The wasting of the intrinsic hand muscles was distinct. The deep reflexes on the right side were increased, chiefly in the upper limb; the plantar reflexes remained flexor in type.

Present Condition.—The aphasia has now largely cleared up, and amounts merely to hesitation in speech with some slurring of articulation. There is moderate weakness of the right lower face and of the right upper limb at all joints. The right lower limb is practically normal. There are no sensory changes save in the right hand. He can feel and localize light touches and pin-pricks all over the hand, though there is occasional atopognosis. Heat and cold are appreciated normally. Joint sense is normal in the shoulder, elbow and wrist, but is impaired in all the fingers, the thumb being least affected in this respect. Astereognosis as before. With the eyes shut he fails to recognize objects placed in the right hand, such as a bottle, a watch, a chain, a pencil, a penny, all of which he recognizes promptly with the left hand. The deep jerks in the right upper limb are markedly increased, in the right lower limb only slightly increased; there is no ankle-clonus, and the plantar reflexes are flexor in type.

As regards the question of astereognosis, some authorities, notably Mills and Weisenburg,¹ have endeavoured to limit the stereognostic function to a special cortical centre, separate from the other cortical centres for cutaneous, joint and muscle sense. They go so far as to suggest the postero-parietal lobule as the so-called "stereognostic centre." But we

¹ *Journ. of Nerv. and Ment. Dis.*, 1906, xxv., p. 617.

should note that stereognosis, or the recognition of the shape of solid objects, is not a sensation but a complex psychical process, arrived at by the combination and comparison of various sensory impressions from the hand—cutaneous, muscular, and articular. Moreover stereognosis also implies the calling up of visual and other memories and their comparison with the actual sensations felt in the hand at the moment. If any of these primary sensations be deficient, a stereognostic judgment may be impossible, even with an intact cerebral cortex. There are numerous morbid states in which we may meet with astereognosis. Thus, for example, it is a common phenomenon in cervical tabes, where the patient complains that he cannot recognize objects in his pockets, such as coins or keys; again, in some lesions of the optic thalamus, astereognosis is well marked in the contralateral hand, and in cortical lesions of the sensory areas, as in the present case, astereognosis may be complete. In this case the postero-parietal lobule was unaffected, the lesion being in the middle part of the post-central gyrus. There is, therefore, no sufficient reason to postulate a special stereognostic centre, whether in the parietal lobe or elsewhere.

Three Cases of Gout showing Destructive Changes in Bone.

By J. BARNES BURT, M.D.

I HAVE to thank Mr. J. R. Lunn for allowing me to show these cases :—

CASE I.

W. B., joiner, aged 67, has suffered from gout on and off for the last twenty-five years. It began in the left ankle; practically every joint in the body has been affected at one time or another. The hands were first affected twenty-one years ago; "chalk" appeared twelve years ago. There is no history of gout in any member of the family. The man occupied a good position, and there is no history of alcohol or lead. There are numerous tophi on both hands and around the toes, and a few small deposits in both ears. The synovial membranes of the knee- and ankle-joints are thickened, and the patient has been unable to walk for the last eleven years. Both hands are much deformed by tophi; in several situations the skin has ulcerated.

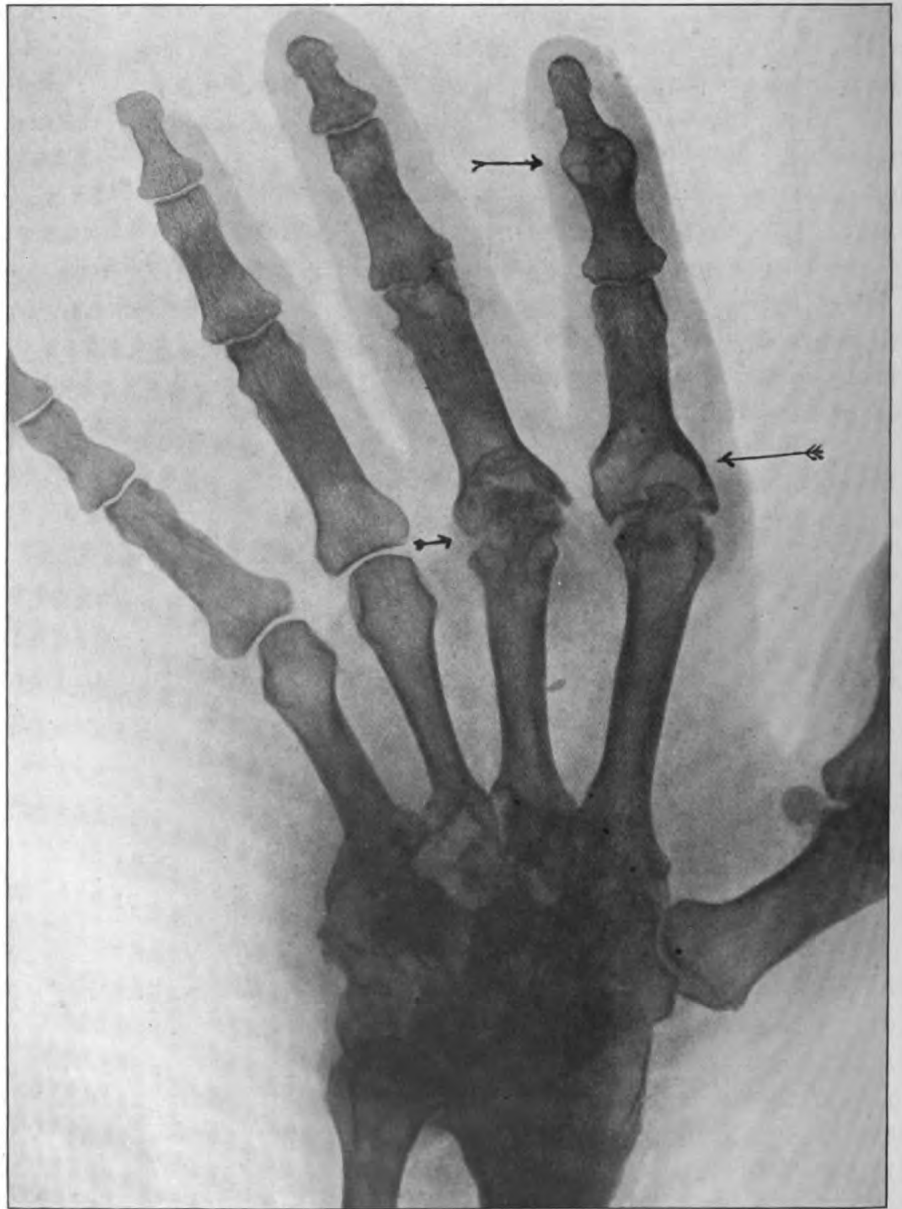


FIG. 1.

Case I. W. B., aged 67. Left hand.

The skiagram of the left hand (fig. 1) shows a "mashed-up" appearance of the carpus and ulnar deflection of the fingers. There is necrosis of bone the size of a sixpenny-bit in the proximal end of the first phalanx of the index finger and the bone is expanded around the area. There is a similar but smaller area in the corresponding phalanx of the next finger; also several small punched-out areas of necrosis in the distal end of the second phalanx of the index finger.

It is important to notice that there is no tophus over the metacarpophalangeal part of the index finger, the small hard lump felt there being part of the head of the second metacarpal bone; also the skin over the area is quite healthy.

CASE II.

E. B., charwoman, aged 36, has suffered from gout for the last five years. The first attack was in the right big toe. The hands were not affected till three years ago; most of the joints have been affected some time or other. Her father suffered from stone in the bladder; no history of gout. There is a history of alcohol.

At the end of last year she was seen in an acute attack of gout. The toes, both knees, and the left wrist were affected. There is a uratic deposit in the right olecranon bursa, also around the terminal joint of the middle finger of the left hand. No tophi in the ears. There is some limitation of movement in the right wrist. At the present time there are no abnormal physical signs in any other joints, with the exception of the terminal joint of the middle finger of the left hand. There is a semi-soft, slightly tender swelling around this joint; on the dorsum is a scar, the site of an incision made a year ago in one of the London hospitals, where it was mistaken for a whitlow. Crystals of sodium urate were obtained from the spot. The movement in this joint is only slightly impaired.

The skiagram of the left hand (fig. 2) shows a necrotic area, about the size of a pea, in the distal end of the second phalanx of the middle finger.

CASE III.

H. J., stableman, aged 55, has suffered from gout on and off for the last five years. He has had rheumatism in his feet ever since he was a schoolboy, but these pains were slight and never prevented work. Both his father and paternal grandfather had "chalk gout."

In January of this year he was seen in an acute attack of gout, affecting first his feet and knees, and later both hands, hips, and neck.



FIG. 2.

Case II. E. B., aged 36. Left hand.

During the acute attack a blister appeared over the terminal interphalangeal joint of the index finger of the left hand. On puncture a milky fluid exuded, which under the microscope was seen to be composed of crystals of sodium urate, together with a few leucocytes. At the present time there are no tophi to be seen. The metacarpo-phalangeal joints of both great toes are ankylosed. In the left hand a small, bony nodule can be felt over the terminal joint of the index finger. Movement in this joint is only slightly impaired. There is slight hyperextension of the proximal interphalangeal joints of the middle finger. Movement in this joint is free. The terminal joint of the little finger of the right hand is ankylosed. Nowhere else on the right hand is there any definite swelling over the joints. There is some hyperextension of the proximal interphalangeal joint of the middle finger, which causes some prominence of the first phalanx, but this disappears on reducing the hyperextension. In three of the joints, viz., metacarpo-phalangeal, proximal interphalangeal joint of the index and proximal interphalangeal joint of the middle finger there is some limitation of movement; in the first two joints distinct grating is felt.

A skiagram of the right index finger (fig. 3) shows a light area in the distal end of the second phalanx, a light area in the distal end of the first phalanx, early changes in the cartilage of the proximal interphalangeal joint, a light area in the head of the metacarpal bone, somewhat advanced changes in the cartilage of the metacarpo-phalangeal joint.

A skiagram of the right middle finger shows a light area in the distal end of the first phalanx, a small bony addition on the inner side of the middle phalanx, early osteo-arthritic changes in the proximal interphalangeal joint.

A skiagram of the left hand (fig. 4) shows a light area in the distal end of the first phalanx of the middle finger, also another light area in the distal end of the second phalanx of the index finger. A small bony addition can be seen on the inner side of the first phalanx of the middle finger.

I would draw attention to the fact that: (1) there are no accumulations of sodium urate over the greater number of these "light areas"; (2) there is an increased density of bone around these areas; (3) the "light areas" have no apparent connection with the joint surfaces. The joints themselves nearest these areas have in some cases no impairment of movement, and in others only slight impairment of movement.

These light areas, on dissection, are found to be erosions of bone, the bone being filled with a deposit of urates. There is a definite

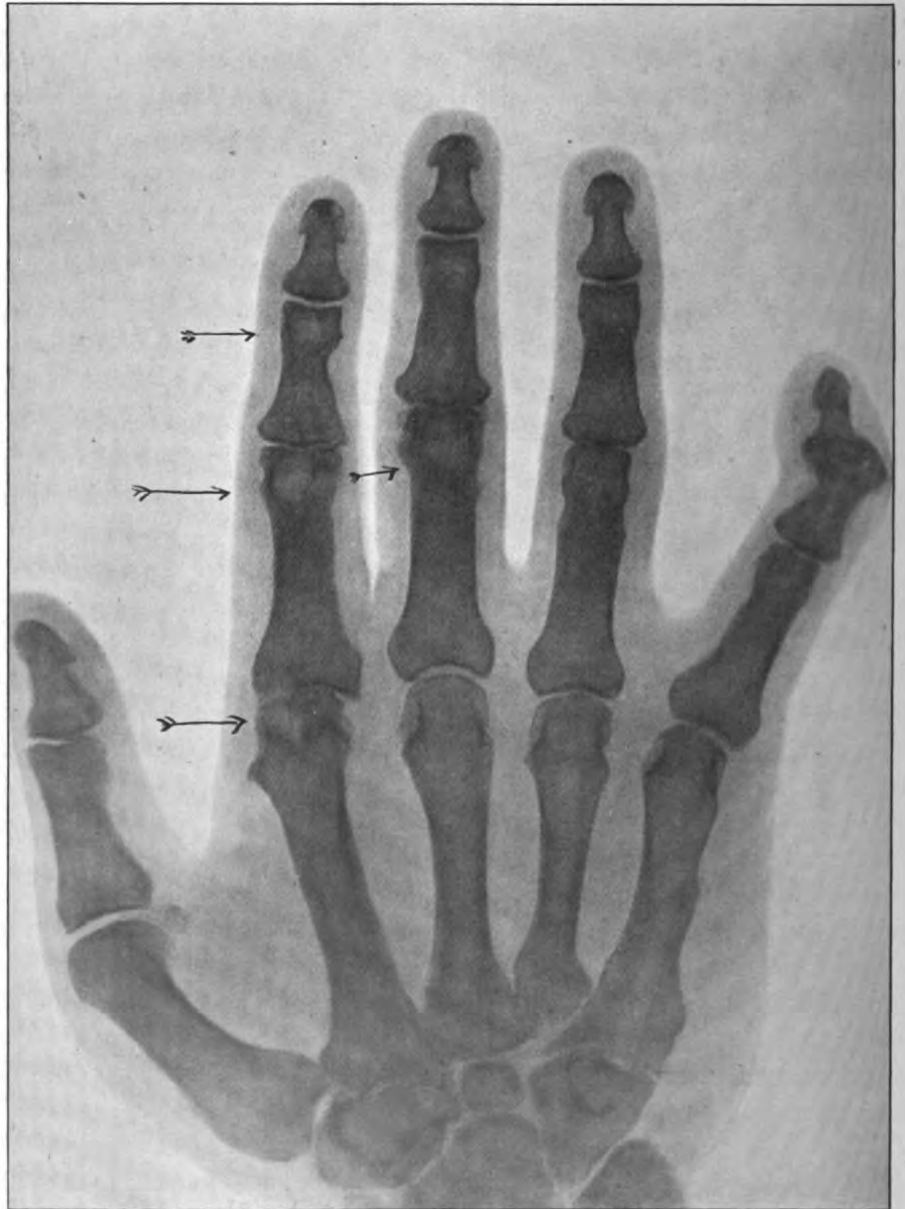


FIG. 3.

Case III. H. J., aged 55. Right hand.

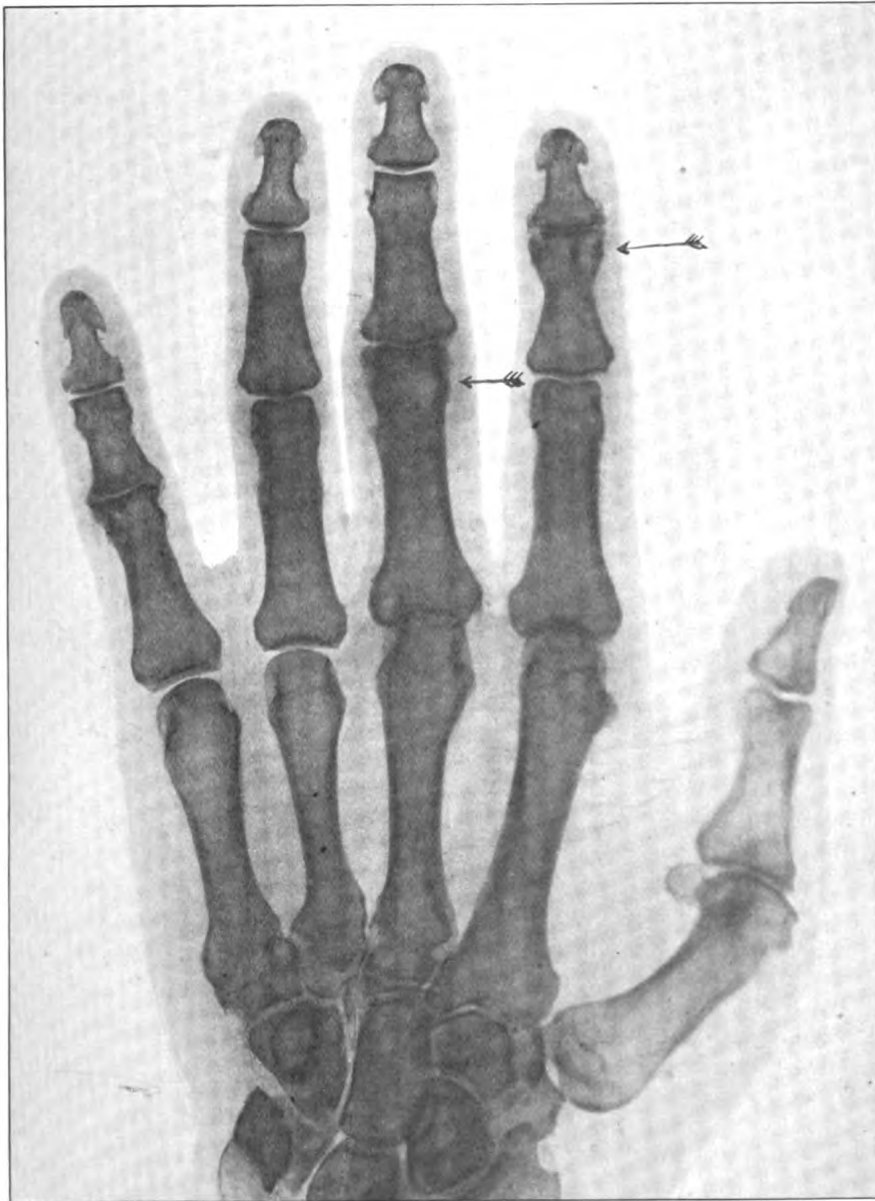


FIG. 4.

Case III. H. J., aged 55. Left hand.

destruction of bone, as definite as that found, for instance, in a tuberculous abscess of the head of the tibia. In fact, I have known this appearance shown in a skiagram of the wrist lead to a diagnosis of tubercular wrist.

Rosenbach [3], on the Continent, and Berkart [1], in England, have examined these destructive changes in the bones of gouty people microscopically. They found numerous deposits of uratic crystals in the bone marrow cut across in places by dead bone trabeculae. Reactive changes were pronounced, giant-cells being present in great numbers.

References to this condition of gouty bones are few. Last year the Committee for the Study of Special Diseases, Cambridge [4], published some details in their *Bulletin*, but many years before this Sir A. B. Garrod [2] mentions erosion of bone in gout, but states that it is due to a direct destruction of bony laminae by continual pressure of uratic accumulations.

That these destructive changes are not caused by pressure atrophy is shown by the fact that (1) where erosion is marked, clinically no tophi can be detected; (2) in many cases there are large tophi in direct relation to bone, but no atrophy occurs, in fact, it is not uncommon to find bone thrown out underneath the tophus.

We must therefore conclude that in cases of gout there may be a definite destruction of bone, following or preceding the deposition of uratic crystals in the bone itself.

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- [3] ROSENBACH. *Virch. Arch.*, 1903, clxxix., p. 359.
- [4] STRANGEWAYS, T. S. P. "A Study of Joints from cases of Rheumatoid Arthritis and Chronic Gout by means of Skiagrams and Dissection of the Affected Parts," *Bull. of the Committee for the Study of Special Diseases*, 1907, i., No. 6, p. 87.

DISCUSSION.

Sir DYCE DUCKWORTH said that the question under discussion was one of degree. There was no doubt that uratic deposit was met with in bone unassociated with necrotic changes. One was reminded of the theory of Ebstein, that before uratic deposit occurred anywhere there must be a preceding necrosed state of tissue. He thought that had been shown to be incorrect in many instances; certainly in cartilage, for where urates had been

dissolved out of the cartilage, sections showed that the cartilage had been intruded upon, but not destroyed. If pressure continued it was conceivable that in many instances necrosis should occur, and that the necrotic cavity should be filled with uratic deposit. He thought some of these cases illustrated another fact, which was not so generally accepted, namely, that the gouty irritation might provoke enlargement of bones in certain situations, quite apart from all uratic deposit. The too common idea that gout meant uric acid and uric acid meant gout had been largely exploded, he was glad to say. At post-mortem examination, and even during life, one found that many of the enlargements occurred independently of uratic deposit. They might be due to uratic irritation, but there was no deposit in them, hence the well-known similarity between some gouty changes and the changes attributed to non-gouty conditions.

**A Case in which, for Recurrent Sarcoma, parts of the
Femoral Artery and Vein were Excised.**

By C. H. FAGGE, M.S.

F., AGED 50, was admitted into Guy's Hospital in September, 1906, for a tumour on the inner side of the right thigh; it had been present six weeks, and had continued to grow in spite of treatment with potassium iodide. It was situated below and internal to the saphenous opening, and was 3 in. to 4 in. in diameter, hard, well defined, not fixed to skin or bone, but was within the muscles. By a long incision the tumour and the whole of the adductor brevis, which was spread out over it, were removed, as it was thought to arise in this muscle. •

Microscopically, it was a spindle-celled sarcoma with some myeloid cells, which in Mr. Targett's opinion arose, not in the muscle, but from the intermuscular fascia. The first recurrence was removed in July, 1907, and she was admitted in December, 1907, for a second recurrence, the size of a golf ball, at the junction of the upper two-thirds and the lower third of the thigh; at this operation the growth was found adherent to the femoral sheath within Hunter's canal and in close proximity to the femoral vessels. The artery and vein were therefore ligatured above and below, and the portions within Hunter's canal, with the long saphena nerve, were removed. The circulation in the leg was quite restored on her discharge eighteen days later. A third recurrence was removed on March 13 of this year.

Aneurysm of the Common Femoral Artery ; Excision of Aneurysm and Common Femoral Vein.

By C. H. FAGGE, M.S.

M., AGED 26, a fitter, was admitted into Guy's for a tumour, the size of an orange, in the right Scarpa's triangle. Four years previously he had a blow in this position with a crowbar, and a year ago he had rheumatic fever ; he had had gonorrhœa. He had noticed the lump for eight months ; it had gradually increased, and had been painful for three months.

The right external iliac artery was enlarged, and pressure over it did not entirely stop the pulsation in the tumour, which was "expansile"; the right posterior tibial pulse was delayed and small. There were no signs of syphilis or cardiac disease. On March 30 the right external iliac artery was exposed and trebly ligatured with No. 4 French catgut ; the lowest ligature was placed about $1\frac{1}{2}$ in. above Poupart's ligament, as below this the artery was dilated. Pulsation in the aneurysm was diminished but did not cease, so the deep epigastric was ligatured and the incision was continued downwards and the superficial femoral artery tied. The aneurysmal sac was dissected out, the anterior crural nerve being peeled off it externally, and, behind, the superficial femoral vein was separated from it to a point at which it joined the deep vein, where its wall became so thin that it was thought necessary to ligature both veins ; the deep femoral artery was ligatured, and the whole aneurysm then came away, the external iliac rupturing below the ligatures as it was pulled down. After the deep circumflex iliac vessels had been exposed and tied, the common femoral vein was tied just below Poupart's ligament, and the wound was sutured with drainage. There was slight superficial gangrene at the inner edge of the wound, and a small blister formed on the heel. The leg and foot presented a mottled aspect for forty-eight hours, after which sensation and power of movement returned, but the pulse in the tibial vessels could not be felt a month after operation.

The aneurysm sac measured $2\frac{1}{2}$ in. vertically, $3\frac{1}{4}$ in. antero-posteriorly, and $2\frac{1}{2}$ in. transversely ; it is distinctly "fusiform," two-thirds of its circumference projecting behind a line joining the external iliac and superficial femoral arteries ; the origins of both the superficial and deep femoral arteries are involved by the sac, from which they arise at an

interval of $\frac{3}{4}$ in.; the external and internal circumflex arteries also arose from the sac. Above the aneurysm the external iliac is dilated to twice its normal size for a distance of 1 in.

Scleroderma.

By G. A. SUTHERLAND, M.D.

Boy, aged $5\frac{1}{2}$. Patient had an attack of measles six weeks ago, from which he recovered, but three weeks ago his father noticed that the skin of the boy's face felt tense and hard. He also seemed unable to open his eyes fully. The characteristic induration of scleroderma affects the face, including the eyelids, the scalp, the neck, and the upper and lower extremities. The tongue is distinctly hard. The ears are quite free from any thickening, and the skin over the trunk is only slightly affected. There is no leucoderma or pigmentation. The skin for the most part is dry and harsh. A scratch on the indurated parts produces a persistent white streak, while one on a healthy part produces a red streak. The boy's general condition and development are good.

Multiple Symmetrical Lipomata.

By ALBERT CARLESS, M.S.

M., AGED 37, first came under observation at hospital for this condition in 1905. He is a public-house manager, but has been very temperate of recent years. The trouble first showed itself on the left side of the face, two years before admission, as a small lump, which used to vary in size; but subsequently other swellings appeared on the right side of the face and behind the left ear. He had been operated on twice before admission.

Photographs were shown representing his appearance in June, 1905. There were large tumours reaching from the zygoma downwards to the angle of the jaw, and backwards behind the ear on either side; also a submental mass, and one in the occipital region. The facial masses were removed by operation, and it was found that the growths were definitely limited, but burrowed deeply. Their removal was difficult in the extreme, as the main vessels in the neck were laid bare and there were many adhesions.

In November, 1905, he was again admitted, and the median submental mass removed. Here, too, the mass, though apparently diffuse, was in reality limited and well defined. This mass was easier of removal than the previous ones. The occipital mass was removed during his stay in hospital on this occasion. This, too, was definitely limited, though very adherent to surrounding parts; it had burrowed into and amongst the muscles at the back of the neck. At this time other growths were noted, one in the middle line over the isthmus of the thyroid, and one over each internal condyle in the arm.

In February, 1908, he again came under observation, and this time the main trouble was in the neck. The tumour in front of the thyroid isthmus had grown as large as a cocoanut, and projected above the manubrium. It appeared to be well defined, did not move on deglutition, and caused no trouble in breathing or swallowing. It appeared to burrow deeply into the neck, and the veins over the chest wall were dilated, as if there were some mediastinal pressure. The mass was dissected away on February 15, and had burrowed deeply and widely; prolongations passed backwards and downwards on each side, and finally disappeared along the vessels into the chest, where they could not be followed further. The side of the neck and the face have also been occupied once again with fatty masses, and there are symmetrical growths over the deltoids, over the spines of the scapulæ, in the arms on either side, &c.

The points of importance in this case are that these growths, though sometimes termed diffuse lipomata, are in reality limited and localized, although the limits are sometimes difficult to define in the midst of the surrounding fat; that they tend to burrow and become adherent to surrounding parts, and that this burrowing may occur into regions such as the chest, where serious symptoms from pressure on important structures may result.

Caries of Spine with Clubbing of Fingers and Toes.

By P. MAYNARD HEATH, M.S.

S. W., A GIRL aged $6\frac{1}{2}$, has suffered from spinal caries for four years. The disease has apparently become arrested, but with great deformity of the thorax. The clubbing of the fingers and toes has been noticed for twelve months. There is no evidence of abscess formation or of lung disease. The child suffers from occasional attacks of cyanosis. An X-ray photograph shows very little change in the terminal phalanges.

Multiple Idiopathic Hæmorrhagic Sarcoma of the Skin.

By F. PARKES WEBER, M.D.

JACOB Z., aged 52, except for the present disease has enjoyed good health. His father is still living, aged 87. The disease is said to have commenced about six years ago, when he chanced to wound the sole of his right foot with a nail. A pedunculated growth arose from the wound, which was removed by a medical man. Afterwards small, slightly elevated, hard, bluish or purple spots appeared in the skin of the lower extremities, especially the feet, and the left foot and ankle became swollen. From time to time sessile or pedunculated outgrowths, mostly not larger than a lentil or pea, develop on the affected parts, chiefly on the left foot, and the little pendulous tumours tend to become ulcerated and drop off, or are knocked off accidentally. At present, except for a few minute raised purple or bluish spots on the hands and on the glans penis and neighbouring skin, the disease is confined to the lower extremities. It is most advanced in the left foot, over a great part of which the dark purple spots are confluent, and there is persistent œdema of the left foot and leg. Two or three characteristic little pendulous tumours on the left foot are "ripe" and quite ready to drop off. On the right foot there has for years been a large patch of brown pigmentation, the exact relation of which to the disease is uncertain. The lymphatic glands are not affected. The present case is a typical one of Kaposi's so-called "multiple idiopathic hæmorrhagic sarcoma," which J. Hutchinson has described as the "sarcoma melanodes of Hebra and Kaposi," and for which other terms have also been proposed, such as "granuloma multiplex hæmorrhagicum," "acro-angioma hæmorrhagicum," and (Unna) "acro-sarcoma multiplex cutaneum telangiectodes." A description of the present case with microscopic examination was published three years ago (Parkes Weber and P. Daser¹). Since then the disease has not progressed much. The patient has been away from London most of the time, and apparently no prolonged course of arsenic or atoxyl has yet been tried. There is no sign of any visceral disease. In June, 1906, there was a temporary erysipelas-like attack in the left (*i.e.*, the œdematous) lower limb. Microscopic examination

¹ *Brit. Journ. Derm.*, 1905, xvii., p. 135.

of one of the little polypoid tumours, removed in May, 1908, shows, as before, that the abnormal growth in the corium consists chiefly of spindle-shaped and elongated cells, arranged to some extent in strands and bundles, and richly supplied with capillaries distended with blood. Besides the dilated blood-vessels there are dilated lymph spaces in the growth, and in places there is extravasation of blood.

Two Cases of Congenital Absence of both Thumbs, &c.

By HENRY CURTIS, F.R.C.S.

MR. HENRY CURTIS showed skiagrams and one of the patients exhibiting this somewhat rare deformity, both cases having been met with at the Metropolitan Hospital, Kingsland Road, within the last four months (January to April, 1908). One of these, a young man, aged 19, a Russian Jew, was under his own care; the other, a girl aged 6 months, was under treatment for scurvy rickets by Dr. Langdon-Brown, physician to the hospital, to whom the exhibitor expressed his thanks for ready permission to report the case with his own. This patient, whose deformity is indicated in the skiagram, showed no other malformation, but Dr. Langdon-Brown made the interesting observation that another child in the family suffers from congenital heart disease. The skiagram showed the commoner variety of this deformity, namely, absence of thumb and first metacarpal, associated with defective (or in some cases absent) radius.

The patient shown to the Section, under Mr. Curtis's care, is an example of the other and rarer type, where the absence of thumb and first metacarpal is unaccompanied by any defect in the radius, which, as the skiagrams showed, is as normal as the ulna. The trapezium and the scaphoid are also entirely absent; the trapezoid is present, but, perhaps, not quite normal in shape, all the other carpals, metacarpals and phalanges (with the exception of the middle phalanx of the little finger, which is shortened) appearing to be normal. The little finger on both sides is shorter than normal.

There is some appearance of a thenar eminence, probably the result of constant practice in attempts to adduct the first digit (index finger) so as to grasp articles such as knife, or fork, or pen, which the patient can hold between the first and second digits.

He can write his name fairly well, but he says he cannot carry dishes, and that, owing to his deformed hands, he is unable to follow any occupation. He is stunted in body, and his facial aspect and general physiognomy, together with his apparent lack of initiative, suggest that his intelligence is also somewhat defective. The skiagrams, including the stereoscopic views, were prepared by the radiographer to the hospital, Dr. Finzi.

Case of Multiple Rheumatic Nodules in an Adult.

By FRANCIS HAWKINS, M.D.

MARY A., a single woman, first came under my observation when she was aged 35. She then complained of pain all over, from her head to her feet, but more especially in the shoulders, and of frequent palpitation. On examination it was noted the face was red in colour and the skin of the body a light olive tint and quite dry. There was no swelling of the joints, but the knuckles were slightly enlarged. The apex beat was in the fifth interspace in the nipple line. A presystolic thrill was felt, and on auscultation a presystolic and systolic murmur were heard at the apex, with reduplication of the second sound at the base. The appetite was fair; bowels regular; liver normal in size; temperature 98.4° F. Urine: specific gravity 1020, acid, no albumin; periods regular; no nodules present. Twelve days later patient complained of pain over the cardiac area. The *alæ nasi* moved on respiration, the pulse was irregular, and distinct pericardial friction was heard; the temperature was 99.8° F. A day or two later nodules were observed as follows: on the spinous processes of the dorsal vertebræ, one nodule on the inner side of the left scapula and two nodules on the right scapula, several nodules over the occipital region and also on crown of the head, on the left ulnar 3 in. from the elbow and one on the right ulnar in a similar position, one nodule on the inner tuberosity of the left humerus, and one in the middle of the supraciliary region. Four days later several more nodules were noted on the ulnars, and two days later two nodules appeared on right internal malleolus and one on the left, and on the day following one nodule appeared on the index finger of the left hand.

Previous Illnesses.—When aged 19 this patient had rheumatic fever; this was followed by chorea. When aged 23 she had a second attack of

rheumatic fever, and she states that during this attack she had nodules on the head and on the spines of the vertebræ. I have in my notes the fact that she has also suffered from facial paralysis, but no note is made as to time or which side of the face was affected.

Family History.—An aunt on her father's side died from heart disease following rheumatic fever; her father died from pulmonary tuberculosis, as did also a sister.

One year later I again saw this patient when she was suffering from œdema of the feet and legs. She then informed me that the nodules previously described did not entirely disappear till four months after their first appearance, but at this time I noted one nodule on the middle of the left clavicle and two smaller ones at the outer end of the right clavicle. I could neither see nor feel any other nodules.

One year afterwards I again saw this patient, when the nodules were still present on the clavicles. On this occasion the patient was suffering from severe anginal attacks.

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OF THE
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DERMATOLOGICAL SECTION



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The Council think it right to state that the Society does not hold itself in any way responsible for the statements made or the views put forward in the various papers.

Dermatological Section.

October 17, 1907.

Dr. RADCLIFFE CROCKER, President of the Section, in the Chair.

BEFORE proceeding with the ordinary business of the meeting, the President made the following remarks:—

GENTLEMEN,—As this is our first meeting for the ordinary work of the Section, a few preliminary remarks from your President may not be out of place.

We may regard the organisation of a Section of Dermatology, as a part of the work of the Royal Society of Medicine, as a not unimportant step in the recognition of the status of dermatology in medicine, both as regards its immediate past and its near and distant future.

A new branch of medicine, and ours is barely a hundred years old, passes through three stages. First, pioneers like Willan and Alibert strive to penetrate into the virgin forest of isolated or ill-observed facts and the crude or fanciful theories regarding them, and begin to clear away the rubbish and fallen lumber of past ages and to make paths through the hitherto trackless forests, putting up finger-posts or at least blazing the trees as they go, so that their successors with little effort may pass along where they have forced their way with such toil and difficulty.

Others soon follow, making the paths plainer, and some go further than their predecessors, but still progress is slow until the advent of some great man, like Hebra, who makes the paths into broad roads, and the second stage is reached. Along these highways, where there were but solitary travellers, are now throngs of workers, until the roads are clear enough for any one who takes the trouble to find his way, though there are still byways and tracks enough for those who devote their lives to their investigation. This is the third stage, which we have reached to-day, and the main facts of dermatology are now open to every student who has acquired the preliminary groundwork of a sound knowledge of general medicine. I lay stress upon this, as whoever takes up a specialty without it comes perilously near to the quack, and puts a stone into the hand of those who are only too ready to throw it.

The extremely rare occurrence of many of the diseases of the skin, and the great gaps in our knowledge of the etiology and pathology of many even common dermatoses, afford problems for the expert to work at for another century at least.

Standing here in the presence of many who in the last twenty years have by their work done much to place dermatology where it now is, I say to our younger members that they have plenty to encourage them to follow their predecessors' footsteps, and though it is not the rule in science for workers to see the fruition of their labours as we do this day, yet, starting from a higher platform than their teachers, they may reach heights that we can barely dream of.

Gentlemen, I trust we shall work earnestly and harmoniously to make this Section a success, each for all and all for each, and that whether our respective knowledge be little or much we may place it unreservedly at the service of this Section.

In conclusion, I have only to announce to you that the plan the Council proposes to adopt is that the private cases shall be taken first, and the rest of the cases as far as possible in the order of their announcement to the secretaries; that they shall be examined on the chair here placed, and that then, when desired, a brief discussion may take place on each case, but I would especially beg you to be terse and to the point in your remarks.

Finally, it is earnestly hoped that exhibitors will furnish the secretaries as soon as possible with a brief account of their cases in a form ready for publication, and stating only essentials. For although there will be a reporter present, his account, even though edited by the secretaries, will often be unsatisfactory; a personal report will not only materially lighten the work of the secretaries, but add much to the interest and value of the proceedings; and though it involves some pains and self-sacrifice, it is hoped that all members of the Section will be ready to make it.

The following cases were shown:—

Case of Lupus Erythematosus, affecting the hands and feet only.

By H. G. ADAMSON, M.D.

The patient was a young woman (L. C.), aged 22, a shop assistant. She was well nourished, but had marked "chilblain circulation"; her nose was blue and cold, as were also her hands and feet. Over the

palmar surface of the fingers and thumbs, and along the thenar and ulnar sides of the palms, were irregularly-shaped patches with dusky red erythematous margins, and whitish, thinly raised central parts. There was practically no infiltration of the patches, and the redness could be pressed out, leaving only a brownish stain around the central scar. There was a similar condition over the dorsal surfaces of the proximal and penultimate phalanges. The toes were of a deep purple colour and very cold; they also presented patches like those on the fingers, except that some of the patches were here excoriated and others crusted. There were no lesions on the ears, face, scalp, nor elsewhere. The patient had a husky voice, but no cough, and there was no evidence of tuberculosis. A sister had consumption, and was in the Brompton Hospital.

The patches had begun to get more red and aching during two or three recent cold days. The patient had suffered as a child from cold hands and feet, with chilblains in the winter, but the present condition had begun only two winters ago. Towards the end of 1905 red patches had appeared upon the fingers and toes. The patches had swelled and had run together until the whole finger was swollen to twice its normal size. This swelling, accompanied by much aching, had lasted through the winter. It had subsided during the summer, but the red patches had remained. The swelling had again appeared at the beginning of last winter, and had subsided as before during the summer, but leaving more marked and more numerous red patches—in fact, the condition which was now present.

There was no evidence of paroxysmal attacks of "dead fingers" followed by lividity, such as was characteristic of Raynaud's disease.

Case of Morphœa, in a Woman aged 65.

By GRAHAM LITTLE, M.D.

The patient had been under observation at St. Mary's Hospital at long intervals during the past five years; the disease was stated to have been noted by the patient for about six years. When she had first come to St. Mary's, the condition noted was that of a patch of morphœa occupying the middle third of the anterior surface of the right leg. The sclerodermic area was surrounded by the usual halo of redness, and this condition had persisted unchanged for several years. She had ceased to attend for a considerable period, and when seen again, a week ago, the disease had very greatly increased in area, so that now the whole

4 Macleod : *Case of Chronic Exfoliation of the Lips*

right leg and foot from the instep to the knee were sclerodermic, and the soft parts of the leg had been constricted and atrophied, so that the right leg was 3 ins. less in circumference than the left. The sclerodermic condition was continued on to the dorsum of the foot, but the foot was not equally atrophied with the leg. Two new areas of scleroderma, circumscribed and the size of a sixpence, had appeared on the front of the left leg, and a larger lesion, the size of a shilling, on the lower part of the abdomen.

Within the past few months the middle third of the anterior surface of the right leg—the earliest site of the disease—had become the seat of an obstinate ulceration, causing considerable pain and discomfort, and at a meeting of a medical society, at which the case had been shown by the general practitioner under whose immediate care the patient was, an opinion was generally supported that amputation of the right leg would be preferable to retaining the diseased limb. Opinions as to this course were now solicited, the exhibitor having considered that the solution was too drastic to be recommended. The woman was in other respects, considering her age, in fairly good health.

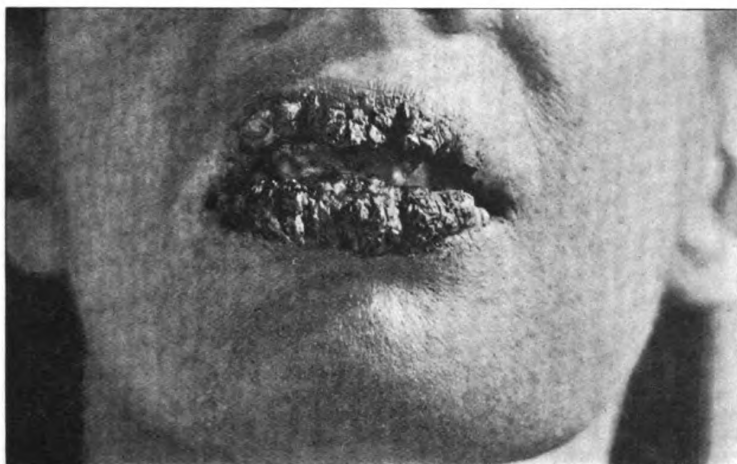
It was generally agreed that amputation was not desirable. Bier's method of compression was suggested as likely to be useful in stimulating the healing of the ulcer.

Case of Chronic Inflammation and Desquamation of the Lips.

By J. M. H. MACLEOD, M.D.

An unmarried woman, aged 29. The patient was a delicate-looking woman with a highly neurotic temperament. She worked as a dress-maker and had the anæmic appearance associated with an indoor life and insufficient fresh air. There was a family history of tuberculosis, her father and sister having died of pulmonary tuberculosis, and there were suspicious signs of it in the patient, such as severe cough, dulness at the left apex, &c. The condition of the lips for which she came under observation was a peculiar crusted affection involving the red portions of both lips, but especially the lower one. Both lips were swollen and protruding, and were encased in an irregularly-fissured scab of a yellowish-green colour, which extended from the cutaneous margin of the lips and gradually faded away in the mouth. The crusts were somewhat firm in consistence and were loosely adherent to the lips, so that they could be picked off easily, leaving the lip glazed, oozing in places; and here and there, where the scab had been more firmly

attached, laceration had occurred and there was slight bleeding. There was no definite hypertrophy of the labial mucous glands. At the time when the case was exhibited the crust was comparatively slight, as a mass of it had been removed three weeks previously and it had not yet had time to re-form, but when it was at its maximum it reached a thickness of half an inch. Associated with the affection of the lips there was a septic state of the mouth. The teeth were covered with tartar, the gums sodden, and there was slight pyorrhœa alveolaris. The salivary and mucous secretions were viscid, and the tongue and mouth were dry.



To illustrate Dr. Macleod's case of chronic exfoliation of the lips.

The affection had begun eighteen months previously, immediately after the death of her sister from phthisis. It commenced with slight desquamation of the lower lip. This gradually increased till her lips were encased in scabs. She was first seen by the exhibitor at Charing Cross Hospital, where she was sent by Dr. Samuel Welch on August 12, when the whole of the scab was removed, the lips painted with 3 per cent. silver nitrate solution, and an antiseptic salve and a mouth-wash prescribed. She returned to hospital in the middle of October with the affection as bad as ever. It was on this occasion that the accompanying photograph was taken. The crust was again removed and is now gradually recurring.

This peculiar affection began as slight infective desquamation of the lower lip, which was gradually transformed into its present condition by more or less constant sucking and working the lip under the teeth, and so inducing an excessive flow of altered viscid saliva and mucus. The case had proved most resistant to treatment, a fact which was partly accounted for by the hysterical character of the patient, who made no great effort either to remove the scabs herself or to prevent their recurrence.

Cases of a like nature to this have been exhibited at the Dermatological Society of London by Galloway (*Brit. Journ. Derm.*, vol. vii., 1895, p. 113), and Morris (*Brit. Journ. Derm.*, vol. xi., 1899, p. 315). In Galloway's case there was also a marked neurotic element in the patient, and a similar purulent state of the gums. Somewhat similar cases have been described by Besnier and Doyon under the heading of "Eczéma exfoliant des lèvres," and by Brocq as "Séborrhée des lèvres." It may possibly be allied to the "Cheilitis glandularis" of Volkmann, but in these cases hypertrophy of the mucous glands was a definite characteristic, and it was absent in the above case.

Dr. RADCLIFFE CROCKER said that he had seen a somewhat similar case heal under X-rays.

Case of Multiple Lupus Vulgaris following Measles.

By J. M. H. MACLEOD, M.D.

The patient was a delicate girl, aged 6. She was an only child. Her mother was healthy, but her father suffered from pulmonary tuberculosis. When she was 4 years of age she had measles, and immediately afterwards the tuberculous lesions appeared on the skin. The patient was fairly well nourished, but was pale and anæmic. With the exception of the measles, however, she had had no serious illness. A physical examination failed to detect any signs of disease in her lungs or other stigmata of internal tuberculosis.

When she came under observation at the Victoria Hospital for Children, twelve tuberculous lesions were counted on the skin; these were situated on the face, both arms, right leg and right buttock. They varied in size from a split-pea to a shilling, the two largest being situated on the right buttock. The lesions were typical of *Lupus vulgaris* of the nodular variety; they were slightly raised above the level of the skin, and brownish-red in colour. The majority of them presented a smooth surface, those on the buttocks being slightly verrucose.

In addition to the Tuberculosis cutis a number of the lupus patches were situated in the midst of a circular patch of inflamed, slightly scaly skin. These patches were markedly circular, and varied in size from a shilling to a half-crown piece. There were also a number of irregular pinkish-yellow patches of dermatitis about the shoulders and neck. The latter appeared to the exhibitor to be patches of seborrhoic dermatitis, but he was uncertain of the nature of the circular lesions, and he considered the possibility of their having been artificially produced by some application which had been made to the lesions previously. These patches were of recent origin, having only been noticed for a few weeks.

The above case adds yet another to the list of cases of Lupus vulgaris developing rapidly after measles. In these cases it is believed that the tubercle bacilli reach the skin *via* the blood-stream, and that their source is probably an infected bronchial gland which has broken down as a result of the measles and infected the blood-stream.

The feature of the case which attracted most attention was the inflamed areas in which the lupus lesions were situated. Several members suggested the possibility of their being Lichen scrofulosorum, while others considered that they were caused by an irritant application. The exhibitor promised to report further on the case.

Note.—Since showing the case Dr. Macleod has found that an irritating brown ointment was rubbed in, the nature of which he has not been able to ascertain, and since this ointment has been discontinued the circular patches have gradually faded.

Case of Infective Granuloma, of Septic Origin.

By J. H. STOWERS, M.D.,

Who exhibited this patient, sent to him by Mr. G. Templeton. James C., aged 48, unmarried (a mechanic engaged in the workshop of a surgical instrument manufacturer), who, three months ago, suffered from a small "blind-boil" upon the right cheek, an inch and a half below the eyelid, on a level with the ala nasi. A few days later the patient pricked it with a needle and a little sanious fluid escaped. The inflamed area gradually increased and developed into a tense, circular tumour, considerably raised from the cheek, with a smooth, dusky-red surface, upon which a few dilated vessels were visible and freely movable. In the course of eight or nine weeks the tumour was an inch in diameter, and it had not increased in size since. The case was described as an

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Infective Granuloma, of septic origin, and the diagnosis was confirmed by other members of the Section.

The treatment adopted was the application of gutta-percha plaster-mull (Beiresdorf) containing mercury, carbolic acid, and zinc oxide, and under its influence a marked degree of subsidence had already taken place in the space of a fortnight. In every other respect the patient was in good health.

Dr. T. J. P. HARTIGAN showed a case of Multiple Rodent Ulcer and two cases for diagnosis.

Dermatological Section.

November 28, 1907.

Dr. COLCOTT FOX, Vice-President of the Section, in the Chair.

Congenital Pigmentation with Atrophic Scarring, associated with other Congenital Abnormalities.

By H. G. ADAMSON, M.D. (for Dr. ORMEROD).

THE patient was a girl, aged 19, small for her age, and of feeble intellect. The skin presented a generalised, but not universal, retiform pigmentation. The networks of pigmentation had a tendency to grouping in certain parts, and also to distribution with linear arrangement. There were patches occupying the cheeks and the forearms, and others, with clear intervals between, upon the trunk, the upper arms, and the thighs. The linear arrangement was most marked along the upper arms, at the sides of the trunk (in the direction of the lines of cleavage), and along the thighs. The pigmentation was pale brown to reddish-brown, according to its position, being more red on the arms and legs, where the red colour could be pressed out, leaving brownish stains. Several of the areas showed scarring towards their central parts. The scarring was very distinct, and in parts almost suggested the scar from a burn. It occupied mainly the meshes of the pigmentary network, overlapping the net to form uniform patches in the worst parts. This condition of the skin had been present since a few months after birth. In winter the patches were said to become darker and somewhat itchy. The mother stated that the scar had been present as long as she remembered, and there appeared to have been no antecedent inflammatory growth of any sort. Other abnormalities present were: absence of the lobes of the ears, asymmetry of the face, a patch of congenital alopecia, absence of first and second fingers of the right hand, the presence of four toes only on each foot, and two nipples on the right breast.

The pigmentation in this case had recalled to Dr. Ormerod a case of congenital pigmentation which had been shown by Dr. Garrod in 1905,

at a meeting of the Clinical Society, and in the *Clinical Society's Transactions*, vol. xxxix., p. 216, was the following record: The patient was a female child, aged $2\frac{1}{2}$, with characteristics of "Mongolian" variety of idiocy and some evidence of congenital spastic diplegia. There was a peculiar pigmentation of the skin, which had a linear distribution, and in places was arranged in whorls in a remarkably symmetrical manner. Dr. Colcott Fox had regarded the case as one of linear papillomatous nævus in a very early stage, preceding the actual papillomatous development.

The case now exhibited recalled also another case, which had been shown by Dr. Adamson at a meeting of the Dermatological Society of London (*Brit. Journ. Derm.*, vol. xix., No. 6, June, 1907, p. 198), an extensive unilateral nævus in an infant, occupying the whole of the left side of the trunk and the left leg. In this case, in addition to dusky red mottled streaks made up of minute flat papules, there were on the calf and on the sole linear warty growths. A remarkable feature about this case was that the warty growths and flat papules had since disappeared, leaving in their place a mottled pigmentation with atrophic scarring, and the left nipple, which was absent, had since made its appearance.

Circinate Erythema of two years' duration in a Boy.

By H. G. ADAMSON, M.D.

This case had been shown on a previous occasion (*Brit. Journ. Derm.*, November, 1906, p. 403). The exhibitor compared it to two cases recorded by Dr. Colcott Fox (*Clin. Soc. Trans.*, vol. xiv., p. 67, and *International Atlas*, plate xvi.) and to another case under his own observation (*Brit. Journ. Derm.*, vol. xix., June, 1907, p. 199).

Since last shown (twelve months ago) the eruption had several times disappeared, sometimes spontaneously, sometimes apparently under the influence of salicin internally. The condition was now much the same as when described in November, 1906.

Case of Lichen Spinulosus.

By J. L. BUNCH, M.D.

The patient was a boy, aged 6. The lesions were distributed over the trunk, arms, and thighs, and were especially well marked at the back of the neck, where there was a group of prominent spiny processes,

projecting a sixteenth of an inch beyond the surface of the skin. In other positions also the lesions consisted of filiform spines and showed a grouped arrangement. On the trunk there were numerous papules of about the size of a pin's head, apparently due to the blocking of pilosebaceous follicles. These lesions did not, as a rule, differ in tint from that of the normal skin, but on the abdomen especially some showed slight redness. Scattered horny papules were present in considerable numbers on the back. The boy was in good health, and did not complain of itching, nor were any scratch marks visible. No plane lesions of lichen planus were present. The case was evidently not one of keratosis pilaris, nor was there any reason to suspect a tubercular origin of the affection. There was no evidence of the disease being infectious, and no black-topped comedones were present like those occurring in the descriptions of Brooke's disease.

Case of Coccogenic Sycosis.

By T. COLCOTT FOX, M.B.

The patient was a barman (F. G.), aged 27, suffering from double otitis media, and now cured of a sycosis which had involved all the hairy regions of the face for ten months. Dr. Fox was indebted to his colleague, Dr. R. G. Hebb, for his kindness in treating the case in his wards at the Westminster Hospital, and for allowing the exhibition of the patient. Dr. Hebb obtained from the beard greyish-white colonies of a staphylococcus growing in tetrads, which was neither the *S. pyogenes aureus* nor *albus*, and confirmed this result by subsequent careful cultivations. On October 8 the patient was injected with 1,000,000,000 of the dead cocci into the left forearm; the face reacted, and an area of red swelling appeared about the site of injection. The temperature on the night of October 9 rose to 100° F. On October 14 the face inflammation had notably subsided, and was now covered with fine, dry scales. On October 16 the opsonic index was 0.84. On October 23 the patient was injected with 1½ c.c., containing approximately 1,500,000,000 cocci, and there was no reaction. On November 1 the skin of the face was better, but rather tender, though he shaved himself. Only two or three pustules remain on upper lip and chin. On November 2 a third injection of 1,500,000,000 staphylococci. On November 11 a few fresh pustules appeared, but the face generally looked cured, except for some redness and desquamation, and a vegetating infiltrated patch on the chin. On

November 17 a fourth injection was given of 2,500,000,000 cocci, and a red rash appeared over the jaws. After that the condition improved almost to a complete cure, and this afternoon (November 28) there are only two or three pustules and the remains of the vegetating infiltrated patch on chin.

Case of Verrucose Nævus.

By WILFRID S. FOX, M.D.

The patient was a woman, aged 24. The condition was very extensive over the upper part of the trunk in front and was limited behind to the interscapular region. The breasts and sternal region were covered with linear and irregular clumps of typical acanthomata; in the axillæ the small growths were, as is usual in these cases, more pendulous and hung in clusters, some of the individual ones being as large as a big raisin. The increase of pigmentation was well marked, more especially over the sternum. The first signs of the deformity were noticed very soon after birth on the back, but nothing appeared on the chest until after puberty, and at the age of eighteen there was a considerable increase in the size and in the area covered by the small warty growths. The points of interest in the case are that, on the situation where it was first noticed soon after birth, there had been very little increase; but on the front of the thorax, where there was nothing to be seen in childhood, there had recently been very marked growth. Also the opportunity had been taken for testing the effect of kataphoresis on these warty growths, the larger pendulous tumours in the axillæ being chosen for this purpose. Magnesium ions were tried in the right axilla and zinc ions in the left. The treatment had so far been carried out on three occasions at a week's interval; the current was taken from a dry-cell battery, and varied between 20 and 25 milliamperes for fifteen to eighteen minutes. The magnesium solution varied from a 5 per cent. to a saturated solution of the sulphate. On the right side, where the magnesium salt had been used, there was very little difference in the size of the growths, but on the left the zinc had caused the tumours to shrivel and shrink to less than half their previous size. The exhibitor desired to express his indebtedness to Dr. Freshwater for carrying out the electrical treatment.

Case of Chronic Œdema of the Face.

By WILFRID S. FOX, M.D.

The condition had lasted for five years. The area affected was around the eyes and the lower part of the forehead. The patient, a man, aged 34, acquired the condition in South Africa, but could not attribute it to any cause. The condition varied with the weather, being worse in cold winds; but there were no erysipelatoid attacks, as are frequently noticed in these cases. On the first occasion on which he was seen there was some thickening of the lobes of the ears, and the condition somewhat resembled leprosy; this diagnosis, however, was disproved by a biopsy, of which a slide was shown. Mr. Barwell was kind enough to make an examination of the nasal cavity on two occasions, but failed to find any purulent focus. The general opinion was, however, that the condition was of streptococcal origin. Dr. Adamson kindly suggested treatment with anti-streptococcal serum.

Case of Pityriasis Rubra Pilaris.


By G. W. DAWSON, F.R.C.S.I.

The patient was a man, aged 46. The condition was not so marked on exhibition as formerly, because ointments had been applied. There had been papules on the backs of the hands and on the forehead. The eruption had persisted for sixteen years. When he first saw it there were some discrete papules, and unguent. acid. salicyl. was prescribed. The condition was rough to the touch, and was unlike psoriasis. A section was exhibited showing hyperkeratosis extending down to the follicle and dilatation of the sweat-glands.

Case of Lichen Planus.

By G. W. DAWSON, F.R.C.S.I.

The patient was a woman, with a condition which began on the face as an erythema. There was redness about the forehead, the eyes, and the chest. The colour, in good daylight, was bluish-red. The case was diagnosed as an anomalous form of lichen planus. There was a good deal of itching, which kept her awake at night, so that she had become thin. The same condition was present on the knees and the buttocks, and was now spreading.



Case for Diagnosis.

By W. T. FREEMAN, M.D.

The patient was a man, aged 50, who presented a soft keratosis on the lips not unlike mucous patches, while inside the cheeks there were several slightly verrucose lesions, and an ulcer about the size of a sixpence inside the left cheek. On microscopical examination the lesions proved to be simple epithelial growths. The affection had begun about four years previously. There was no history of syphilis, and the patient was a moderate smoker.

Case of Erythema.

By T. J. P. HARTIGAN, F.R.C.S.

The patient was an elderly man, with an erythema of the foot which had persisted ten years. There was some œdema, but no affection of the heart or kidneys. During the last six months the hands had become involved, and on more than one occasion of late the lesions had vesicated. There was no sign of atrophy. He regarded it as persistent erythema multiforme.

Case of Lichen Planus, with some Unusual Features.

By E. GRAHAM LITTLE, M.D.

The patient, a young man, aged 25, had suffered for three years from patches of dermatitis on the lower part of the right leg. These patches were of a deep bluish-brown colour, and were covered from time to time with heaped-up scales. No general eruption of any kind had been present, and no other lesions were found on the body. There had been no itching either in these patches or elsewhere. The patient had suffered from varicose veins in this leg, and two years ago had had some of these cut out. In the scar of these operations there was brown pigmentation, similar to, but less deep in colour than, that in the spontaneous patches. The absence of all lesions, or history of these, and of itching made the diagnosis a little difficult. No treatment had been given at any time for the disease.

Case of Grouped Comedones in an Infant.

By J. M. H. MACLEOD, M.D.

The patient was a somewhat delicate-looking boy, aged 14 months, who presented groups of about twenty comedones on his cheeks, and

a smaller group on the chin. The comedones were small in size, and were situated on apparently healthy skin. There were no pustules associated with them, and only one of them was surrounded by an inflammatory halo. The comedones were first noticed when the child was four months old. The mother, who had nursed the infant, had suffered since childhood from acne vulgaris affecting the face, neck, shoulders, and chest, but not the breasts.

With the exception of the fact that grouped comedones in childhood seem to be more common in males than in females, little is known of the etiology of this affection. In this case neither seborrhœa capitis nor the employment of some local irritant, both of which have been suggested as causes, could be blamed for it, as the scalp was free of seborrhœa and there was no history of anything unusual having been rubbed on the face. In a case demonstrated by the exhibitor at the Dermatological Society of London (*Brit. Journ. Derm.*, 1905, vol. xvii., p. 141), in which grouped comedones associated with acneiform lesions were present on the chest of a boy, aged 2, there was a definite history of local irritation produced by wearing a flannel binder, frequently saturated with camphor oil, on the chest.

The fact that the mother suffered from acne and presented numerous large comedones on the face was suggestive of contagion. With the kind assistance of Mr. Leatham, bacteriologist at Charing Cross Hospital, an examination was made of comedones expressed from both the mother and child. For this purpose, after cleaning the skin thoroughly, comedones were extracted in which there was no evidence of inflammatory disturbance, and were inoculated on various media. So far only the *Staphylococcus albus* had been obtained in both cases.

Case of Multiple Lupus Vulgaris following Measles.

(*Exhibited at the previous meeting of the Section—see p. 6.*)

By J. M. H. MACLEOD, M.D.

The case was again presented to show the result of treatment on the red patches of dermatitis which surrounded a number of the tubercular lesions.

At the previous meeting there had been considerable discussion as to the nature of these patches, and various suggestions had been made, such as that (1) they were the result of the action of an irritating

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ointment which had been rubbed into the lupus lesions; (2) that they were patches of lichen scrofulosorum; and (3) that they were patches of seborrhœic dermatitis. The patient was admitted into the Victoria Hospital for Children, and has been under observation there during the last month. It was ascertained that an irritating ointment had been employed before admission, but though the patches faded during the first fortnight in hospital they did not disappear, and at the time of exhibition they were still present around the scars which resulted from the scraping of the lupus lesions, in the form of circular, slightly scaly patches. In addition there were several large irregular patches, independent of lupus lesions, situated on the left thigh. These irregular patches presented all the characteristics of the dry, resistant patches of dermatitis which it is customary at present to include under the somewhat ill-defined heading of seborrhœic dermatitis. For purposes of comparison a case of this nature in a boy, aged 14, was presented, in which several circular patches occurred, which seemed to be identical in character with those on the girl's thigh. The boy had been under observation at Charing Cross Hospital, and in spite of thorough local treatment the lesions had persisted.

During the last fortnight the patches in the girl had been rubbed with sulphur ointment and had somewhat faded under the treatment.

Case of von Recklinghausen's Disease.

By MALCOLM MORRIS, F.R.C.S.Ed., and WILFRID S. FOX, M.D.

The patient was a woman, aged 42, who stated that the condition had been present almost since birth, and that the tumours had not increased in size or number for some years. The case showed most of the usual characteristics, and resembled very closely in some respects a case shown by the exhibitors before the Dermatological Society of London in the spring of this year. The tumours, which were countless, were distributed all over the body and were of two kinds, some being soft, almost fluctuating, subcutaneous masses, others being firmer, projecting from the surface of the skin, and giving a gelatinous sensation to the touch; there were none of the so-called "seedless raisin" type which have been observed in this disease. On the scalp the tumours were large and soft, the largest measuring about 3 inches in diameter. On the face they were small and firm, the majority being about the size of a split pea. On the trunk and limbs they were mostly

firm and projecting, several of them being as large as a hazel-nut. On the left arm, just above the elbow, there was one large, soft tumour below the deep fascia. The pigmentation was of both varieties usually seen in this disease, namely, diffuse freckling and large plaques; the former was well marked all over the trunk, and there were two examples of the latter, measuring about 2 inches in diameter, on the lower part of the back. The nervous signs were not well marked; the only tumours which were painful were the large ones on the scalp; there was no itching or pricking as was noticed in the previous case. The woman was of average intelligence, and did not suffer from epileptiform fits, but occasionally fainted.

Case for Diagnosis.

By MALCOLM MORRIS, F.R.C.S.(Edin.).

The patient was a man, aged 63. About four months ago blisters had appeared on the dorsal surfaces of his fingers and hands. One month later similar large thick-walled bullæ made their appearance on his face, nose, and forehead, giving rise to excoriated patches and being followed by well-defined areas of atrophic skin in the sites previously occupied by the bullæ. There were numerous large comedones on the side of the nose and on the cheeks, and there was also well-marked leucoplakia of both cheeks and of the tongue. The patient had taken tar in considerable quantity for six weeks.

Case of Pigmentation of the Face.

By GEORGE PERNET.

The patient was a young woman, aged 21, with unilateral "freckle" pigmentation about the outer side of left orbit and cheek. The condition began like freckles about four to five years ago, occupying the same area then as now, but the tint had become darker. At catamenial periods the patient stated that the colour became deeper. When seen the tint was a livid sepia.

Lupus Erythematosus of the Face, with a Condition of the Fingers simulating Raynaud's Disease.

By J. H. SEQUEIRA, M.D.

The patient, a single woman, aged 34, had suffered from lupus erythematosus for twenty years. The first spot appeared on the tip of the nose and was thought to be eczema. The disease had slowly spread

on to the cheeks, but for five years was untreated. During the seven years following she had various treatments. Two operations were performed, and in 1896 she had injections of tuberculin. She stated that the face had been better since the injections, and had not required treatment for the last seven years. In 1900, however, her fingers became affected. She said that they "all gathered and discharged." Healing was slow, and during the past three years she described the fingers as "wasting away." The wasting was progressive.

The fingers were tapering, and very thin and claw-like. They were redder than normal, and the colour disappeared on pressure. The skin was thin, shining, and atrophic. She complained that the fingers and hands were "either very cold or very hot." The terminal phalanges of the fingers (not the thumbs) could not be fully extended. The metacarpo-phalangeal joints could be fully flexed, but there was only limited flexion of the interphalangeal joints of the thumbs, and whilst they were bent the skin over the knuckles became very tense and white. The skin of the backs and fronts of the hands showed the same changes in a less degree.

There was evidence of old apical phthisis. The family history was good.

Similar cases had been shown at the meetings of the Dermatological Society of London by Dr. Pringle. The condition did not appear to be true Raynaud's disease, as the process was continuous and not paroxysmal. There had been no hæmoglobinuria at any time, and the urine had been free from albumen while the patient was under Dr. Sequeira's observation. The condition of the fingers on exhibition was a degree of sclerodactyly.

Case for Diagnosis.

By J. J. PRINGLE, M.B. (for Dr. ERNEST A. CRISP).

The patient was a female, aged 18. The history of the case, obtained from her mother, was as follows: No similar or other skin affection was known to exist in the family. The patient's father had probably suffered from syphilis; her skin at birth was perfectly normal; at the age of 1 year a "blister" was noticed on the left buttock. The skin about the privates and lower abdomen soon afterwards became inflamed, and some suppuration occurred at the crown of the scalp, where "the scurf was very thick and the whole separated like a cap, leaving a mattery surface." The skin of the face also "peeled off in ragged scales like tissue-paper."

At the age of 3 years she came under the observation of Mr. Jonathan Hutchinson, who had a water-colour drawing of the condition done by Mr. Burgess on December 5, 1893, which Mr. Hutchinson kindly allowed the exhibitor to show to the meeting. The drawing is now in the *Polyclinic*, and is described as follows: "Dermatitis perstans; portrait showing a very unusual form of chronic dermatitis, which has persisted since infancy, in a child aged 3. The patches were covered with scab and crust, which adhered so firmly that they could not be removed. The skin upon which these horny crusts had formed was somewhat contracted. The condition in infancy had been very severe indeed, and had been supposed to be hereditary syphilis. It did not, however, yield to specific treatment, and when the case came under Mr. Hutchinson's care there were no indications of specific taint. After about a year's treatment, exclusively by local means, the child is now almost well." (The nature of the local means used could not be ascertained.)

Mr. Burgess's drawings, already referred to, portrayed a state of affairs very suggestive of a hystrix in large patches over the buttocks, about the vulva, in the bends of the elbows and axillæ, in broad streaks down the left forearm, with deep brownish-yellow bands of indeterminate appearance on the neck transversely, on the upper and lower lips, as well as on the cheeks, lower eyelids, and supraciliary regions.

The condition had clearly relapsed when she came under the observation of Dr. Ernest Crisp, in August, 1905, who described it as "raised, hard patches, more or less completely covering the body" and involving the scalp. He commenced treatment by 10 minims of Donovan's solution three times a day with hydriodic acid, along with various local applications of mercury, resorcin, and ichthyol; for a year no marked improvement resulted. Dr. Crisp then applied iodised phenol to each "seborrhœic" patch, with the result that in six months "all the body was cleared"; the head and face, though much improved by the local treatment, failed to get well. A visit to Woodhall Spa in July, 1906, proved of no benefit, so she was put upon 8 minim doses of liquor. potassii arseniatis and of Donovan's solution three times daily till she went to Aix-les-Bains in April, 1907.

When the patient came under the exhibitor's observation in October of the present year it was noted that she had (1) typical diffuse arsenical pigmentation over the limbs and trunk; most marked where a pre-existing lesion on the buttocks had been removed by iodised phenol; very characteristic arsenical warty keratosis of the palms and soles, with

marked hyperidrosis and bromidrosis of the latter region. The girl herself was positive in her assertion that all of these phenomena had developed rather suddenly in the spring of 1907, about the time she went to Aix-les-Bains. (2) Diffuse slight xeroderma of neck, trunk, and limbs, with very marked follicular keratosis of the backs of the upper and forearms, thighs, and legs, attaining its maximum of intensity on the tips of the elbows and knees, where irritable horny cones were present. These abnormalities were stated to have dated from early infancy, and were undoubtedly "ichthyotic" in nature. On the backs of the hands, and especially on the proximal phalanges of all the fingers, there were closely packed, horny follicular cones, with a central depression reminiscent of the lesions of pityriasis rubra pilaris, and patches of similar nature were noted on the dorsal surfaces of the feet (probably from pressure). These changes were not depicted in Mr. Hutchinson's drawings. (3) Enormous hypertrophy of the nipples, which projected as filiform corneous masses nearly an inch from the general level of the mammæ. This was stated to have existed as long as the patient could remember, and her assertion was confirmed by the exhibitor that these horny masses fell off from time to time, only to re-form again rapidly. (4) A dense, brownish-yellow, rather gummy scab was firmly adherent to the supraciliary regions and to the upper parts of the cheeks, which could only be separated at the expense of some laceration of the subjacent tissue; and scattered scabby, rather impetiginous lesions were thickly present over the face, ears, neck, præsternal and interscapular lesions. In the latter regions the base of the patches was distinctly hard, raised, and warty. (5) At the vertex of the scalp was a large moss-like patch the size of the palm of the hand, the hair over which was in normal abundance, but which was suppurating freely and harbouring very numerous pediculi. It was especially noted that the pre-existing lesions on the trunk and limbs had been successfully removed without trace of cicatrices. While under observation, and probably as the result of the application of kerosene to remove scabs from the scalp and destroy pediculi, an acute dermatitis had developed over the forehead and neck, with adherent crust similar to that already described.

Dr. Pringle admitted that he was unable to make any firm diagnosis of the case, which did not accord in its entirety with any type of skin disease with which he was familiar. The arsenical manifestations were obvious and characteristic, and easily separable from the other phenomena. The patient was clearly ichthyotic, and the idea suggested itself that she had also had hystrix, which had disappeared either spontaneously (as

reported in a few cases) or as the result of treatment. The tendency to dermatitis on very slight provocation he thought due to some congenital skin peculiarity rendering it specially liable to invasion by pyogenic cocci.

Case of Circinate Erythematous Syphilide.

By A. SHILLITOE, F.R.C.S.

The patient, a man, single, aged 39, bootmaker, attended the Lock Hospital on July 22 last with phimosis, concealed chancre, indurated inguinal glands, and roseola, of five days duration, of the back of the neck and upper part of the trunk. His weight was 9 st. 2 lb. He has always had scurf in the head.

October 21.—He weighed 8 st. 7 lb. He had gone on fairly in the meantime up to two or three days previous, when, without any premonitory symptoms, he somewhat suddenly developed the condition seen, viz., a series of large, complete, bright red, erythematous rings, raised decidedly above the surface, about one inch in diameter, and at first covered with a pellicle, without itching, or signs of inflammation. The first ring started at the right angle of the mouth, in the moustache. In addition there was one ring on the left cheek and several on the posterior and lateral aspects of the neck on both sides, and also over the pectorales majores, where they cease to form the anterior walls of the axillæ.

November 11.—The weight was still falling. A fresh place had developed on the left buttock.

November 18.—Weight 8 st. 6 lb. All the places were rapidly healing.

November 25.—He was not feeling so well, and all the rings were threatening to relapse.

Rodent Ulcer treated by the Introduction of Zinc Ions.

By A. WHITFIELD, M.D.

The patient, a woman, aged 44, had noticed a spot beneath the left inner canthus nine years ago. She had scratched this spot, which bled and then extended. The patient was first seen in November, 1906, and the condition was then as follows: About a $\frac{1}{2}$ inch below the left inner canthus there was an area of the shape of a figure of eight, measuring about 1 inch in a vertical, and about $\frac{1}{2}$ inch in a horizontal direction. It was infiltrated and hard, and covered with a thick crust which, on removal, disclosed an irregular eroded surface of a pinkish colour. The diagnosis of rodent ulcer was made, and as it was

thought that excision would be difficult without causing extensive deformity the patch was treated with radium. After continuing this treatment for some time, with slight improvement, it was decided to substitute the X-rays in order to save time. The patient, however, could not attend very frequently, and therefore long exposures, about half a Sabouraud's pastille, were given at intervals of a fortnight. By this means, on more than one occasion the area exposed was definitely reddened, but no blistering was produced. For a time the case progressed very favourably, but the treatment seemed to lose its effect, and latterly the disease spread while under treatment. The treatment recommended by Dr. Lewis Jones was then inaugurated. The patch was, in two sittings (October 5 and October 12 respectively) electrolysed with the negative pole in contact with the growth, a zinc electrode and a 1 per cent. solution of zinc sulphate being used. A current of ten milliamperes was passed for ten minutes. At the end of that time the area so treated was completely blanched, and a fortnight later there was an ulcer, with rather firm edges, left. At first Dr. Whitfield was inclined to think, from the firmness, that there was malignant tissue left, but as the ulcer healed, which it did very rapidly, all trace of induration disappeared from the upper part. The lower part, which was electrolysed later, still showed some of this firmness, and Dr. Whitfield said he brought it up in this stage to show this point. He should, of course, watch the case very carefully for a long time to come, as it was obviously too early to talk of cure, but he thought that at present the outlook was very favourable, and he felt pretty confident that the slight hardness of the lower edge which was still apparent would disappear spontaneously as it did in the upper part.

Long-standing Pruritus in a Woman, aged 22.

By A. WHITFIELD, M.D.

The history showed that the patient had suffered from pruritus for as long as she could remember. She had seen many doctors, but had derived no benefit. On examination it was found that the whole of the skin, with the exception of the palms and sole and scalp, was covered with small, irregularly-shaped scars, varying in diameter from a $\frac{1}{4}$ to $\frac{1}{2}$ inch. These were cribriform and slightly depressed, exactly resembling vaccination scars. There were also present several deep excoriations, which the patient said she dug out in the night, when the itching was at its worst. The patient did not seem at all hysterical, and there was no

question of any intention to deceive, since the patient herself volunteered the statement that the marks were self-inflicted, though she was not always conscious of producing some of the wounds.

Dr. Whitfield said that he had investigated the case as far as his knowledge went, and he had, perhaps, obtained some light. The blood-coagulation was normal. The urine had been tested for albumen, sugar, bile-salts, and indican, with negative results in each case. The blood-count showed the presence of 2,675,000 red blood-corpuscles per cubic millimetre, and 6,000 white corpuscles. A differential count had shown the following proportions: Polynuclear leucocytes, 57·8 per cent.; lymphocytes, 34 per cent.; eosinophiles, 2·4 per cent.; hyaline, 5·8 per cent. Remembering that pruritus had been recorded associated with deficient polynuclear leucocytes, he had administered thymus extract, but he could not say that in the short time she had been taking it any marked improvement had been noticed that could be referred to the drug. The patient was using an anti-pruritic cream, which did some good.

Sections of Paraffinoma.

By A. WINKELRIED WILLIAMS, M.B.

The patient was injected with paraffin by an unqualified person. The paraffin used was of too low a melting point and diffused into subcutaneous tissue and among the facial muscles. After several months tumours developed along the areas of diffused paraffin. They were excised subcutaneously and recurred; a second excision was followed by same result. Great persistent œdema accompanied the tumours. A portion of tissue excised was cut in two parts, one of which was desiccated over H_2SO_4 , then weighed and then digested in warm xylol for twenty-four hours. After drawing off the xylol it was again weighed, but the loss of weight was very slight. The other part of the same piece was, without hardening or fixation, cut, frozen, and examined in Farrant. It showed, here and there, fine streaks of a clear homogeneous material differing in its refractive index from the tissue and the glycerine, &c., of the Farrant's medium. Other pieces were fixed and hardened in alcohol, and sections showed bands of well-formed fibrous tissue enclosing areas of cells, mostly of epithelioid type, with a large number of multinucleated giant-cells. Sections stained with carbol fuchsin showed no acid-fast organisms. Organisms were not found by any stains. The cellular masses and giant-cells and fibrous tissue were irregularly infil-

trating between the muscle fibres of the facial muscles. The patient so far had declined X-ray treatment. Thiosinamine injection and electrolysis had not yet been tried, as a painless treatment was wished. Arsenic was tried by mouth and pushed to 8 minims of Fowler's solution three times a day. At first slight improvement resulted; some reduction of the oedematous swelling was accomplished, but it relapsed. Thyroid was of no use. The swelling was prevented from progressing by massage and pressure.

Dr. Ormsby, of Chicago, had a similar case, which he showed to the Chicago Dermatological Society. In a letter to Dr. Williams he stated that his patient is deriving great benefit from X-ray treatment. Dr. Unna, of Hamburg, with whom Dr. Williams discussed the case, strongly advised X-ray treatment.

Dermatological Section.

December 19, 1907.

Dr. T. COLCOTT FOX, Vice-President of the Section, in the Chair.

A Case for Diagnosis.

By G. W. DAWSON, F.R.C.S.I.

THE patient, a young woman, aged 33, of healthy appearance, had a peculiar condition of the extremities which began about six years ago on the palms of the hands and soles of the feet, where it remained limited for nearly two years. Since then it gradually extended up to the middle of the forearms and legs, being fairly well demarcated from the sound skin. It was of a brownish colour, and the numerous lines which intersected one another, as well as the roughness that was present, gave it the appearance of crocodile leather. There was, however, no appreciable thickening, no evidence of the follicles being involved, and no itching. Besides this condition there were patches of a psoriatic-looking eruption on the patellæ and elbows.

The eruption, which had never been moist and was of a remarkably uniform appearance, did not appear to correspond to any described condition.

Vegetating Granulomata on the Face.

By T. COLCOTT FOX, M.B.

THE patient was a robust-looking married woman, aged 25. On the face there were four disseminated vegetating granulomata of three months' duration. She had one healthy child and was pregnant with a second; no miscarriages. The four lesions, said to have begun as "pimples," gradually enlarged. The patient said they evolved after a severe cold and sore throat. One lesion, the size of a split pea, was seated on the bridge of the nose and was the first to form; a second, the size of a fourpenny piece, occupied the nasogenal furrow and adjoining surfaces; the third and fourth were rather smaller and seated

respectively on the left upper lip and the left chin. The lesions were rounded, granuloma-like infiltrations, surmounted by marked vegetations, not florid and vascular, but warty in aspect. There were no miliary abscesses from which pus could be squeezed out. Two other lesions grew on the left cheek and chin, but had disappeared, leaving scars.

Although the nature of the disease had not yet been thoroughly investigated, Dr. Fox thought the clinical aspects alone were of interest, and, moreover, the lesions were already markedly subsiding under the influence of the internal administration of *mistura hydrargyri biniodidi*.

As to the differential diagnosis, the exhibitor said no iodides had been taken prior to the evolution of the eruption. The eruption was immediately preceded by what the patient described as a bad cold and sore throat, but there was no history of any widespread eruption. Moreover, vegetating syphilides and tubercloses of the face were usually of the florid frambœsoid type, and not warty like the verrucose tuberculosis of the back of the hand. There was no chronic coccic inflammation as in sycosis to account for the vegetating lesions. Clinically the eruption was very similar to those described in blastomycosis.

Two Cases of Favus of the Scalp.

By E. G. GRAHAM LITTLE, M.D.

CASE I.

THE patient was a woman, aged 40, who had had the disease since early childhood. She was an Englishwoman, a native of Essex, had never lived abroad, and the origin was doubtful. The scalp was almost entirely denuded of hair, old cicatricial atrophy having resulted from the favus; but there was active disease over a large part of the scalp, and absolutely typical scutula were present in this area. The fungus had been readily demonstrated in the hair. This patient had a diseased nail of one finger, the enamel being destroyed and the nail giving the appearance of *moelle de jonc*, which has been described by French authors as typical of favus. Doubtful fragments of mycelium had been seen in scrapings from the nail.

CASE II.

The patient was a boy, aged 8, the nephew of the preceding case. This patient had had the disease since early infancy, but it had spread of late. There were no scutula at all, and the scalp showed circinate, red, pityriasic patches with very little hair in the affected part. Fungus had been seen in one hair after many fruitless examinations.

**A Case of Bazin's Disease (*Erythema induratum*) in
a Young Woman.**

By E. G. GRAHAM LITTLE, M.D.

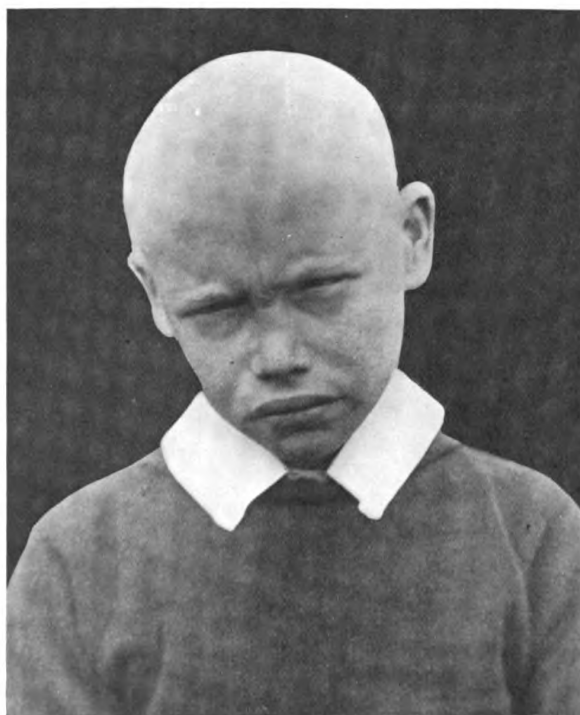
NODOSE swellings had appeared about six weeks or two months previously. These were painless, deep blue, infiltrated and numerous on both legs and both feet. The patient gave the history of previous similar swellings, which had left some permanent scarring. There was no tubercular history, and the patient herself, though anæmic, showed no sign of tuberculosis. The opsonic index had been estimated on one occasion only, and was then 0.96. The suddenness with which the swellings had appeared had at first suggested erythema nodosum, but they were painless, and had now persisted beyond the time limits of erythema nodosum. It might be considered too rapid in development for erythema induratum, but with this exception the diagnosis of that disease would better fit in with the symptoms than any other affection.

**Two Cases of Advanced "*Keratosis follicularis* associated
with Baldness."**

By J. M. H. MACLEOD, M.D., and E. TREACHER COLLINS, F.R.C.S.

THE patients were brothers, aged respectively 13 and 10. The two cases and that of an elder brother similarly affected, whose photograph was shown, first came under the observation of Mr. Collins in 1902, at the School of the Metropolitan Asylums Board, at Swanley. As all the three boys were suffering from trachoma the cases were sent up to Dr. MacLeod's clinic at Charing Cross Hospital, in August, 1907, when the following notes were taken: (1) William B., aged 10, suffering from keratosis follicularis associated with baldness, and trachoma. The patient was a fairly well-developed lad whose general health was good. He was the eldest of five brothers, two of the others being affected with the same condition of the skin. All the regions of the body where hairs occurred, with a few exceptions, were covered with small, pinhead-sized papules arranged in groups or diffusely distributed. The papules were follicular and surmounted by conical horny plugs or spines about 2 mm. in length, and where they were most marked they gave to the skin the feeling of a nutmeg-grater. On picking out the

horny plug a central depression was left. The papules were not situated on an inflammatory base, and except for slight scaliness in certain situations the skin between them seemed to be normal. The distribution of the papules tended to be symmetrical. They were most numerous on the extensor aspects of the arms, the back and sides of the neck, the buttocks, and on the beard and ciliary regions of the face. On the back and loins there were a few groups and several disseminated lesions. A few scattered



Keratosis follicularis associated with Baldness.

lesions were also present on the abdomen, but there were none on the chest, though many of the hair follicles were more visible and palpable than normally. Lesions were absent from the extensor aspects of the legs and part of the face, and in these situations the skin was rough like ichthyosis. A small group of lesions was present on the dorsum of the hands, but none occurred on the backs of the fingers. They were present,

however, on the dorsal aspect of the toes. The eyelashes and eyebrows were absent, but the hair of the scalp was unaffected.

The skin generally felt dry and harsh, though the patient perspired freely in warm weather and after physical exertion. The hands were cyanosed and felt cold. There were no subjective symptoms, such as itching, associated with the lesions. At birth the skin appeared to be normal, but when an infant in long clothes he was taken to Westminster Hospital for advice regarding his skin and eyebrows. The eruption is said to have begun on the face and eyebrows. He had measles when he was five months old and the eruption spread rapidly afterwards.

The patient has had trachoma since he was aged 5, on account of which he had to be removed from school as he suffered acutely from photophobia. The family history shows that the father's family suffered from pulmonary tuberculosis, the father himself not being affected, but the details of the family history were not obtained.

The accompanying photograph of the case shows the absence of eyebrows and eyelashes and the rough skin of the neck and beard region, due to the presence of the spiny papules.

(2) Alfred B., aged 13, with keratosis follicularis. The patient presented a similar condition of the skin to William's, but the lesions were less abundant and more scattered. In this case the front of the chest was not exempt, but as regards the face only the chin was affected. The backs of the hands were more involved and spiny lesions were present on the backs of the fingers. The skin of the extensor aspect of the legs, the front of the knees, and the elbows was ichthyotic. In this case the scalp was markedly affected and was almost totally bald, only a few downy hairs being present on the sides of the head. The scalp was red in front and rough and scaly. The boy was born healthy and the affection was first noted when he was aged about 2. At the age of 7 much of the hair had come out in patches at the back of the scalp, but was present then in front; the eyebrows and eyelashes had gone. The patient has suffered from trachoma since birth.

(3) Leonard B., aged 10, with keratosis follicularis. The patient was similarly affected to Alfred, but in a milder degree. The scalp was only partially bald, a few tufts of normal hair being left at the sides. The patient never had much hair on the scalp. The eyebrows and eyelashes were involved and absent. The patient was born healthy. The disease had begun during his first year, and when aged 2 the skin was rough and the hair of the head had gone. He also suffered from trachoma.

A histological examination was made of several well-marked spiny

lesions excised from the back of the neck in the case of Alfred B., and sections were exhibited. These showed that the mouths of the follicles were dilated and filled with a horny plug occupying the whole of the funnel of the follicle and extending about 1 mm. above the level of the skin. The stratum corneum in the neighbourhood of the follicle showed slight hyperkeratosis, the deeper layers of the epidermis not being noticeably affected. The deeper portion of the follicle was somewhat shrunken, and in one or two of them the remains of an atrophied hair were detected. The sebaceous glands were absent. Sweat glands were present and appeared to be healthy. Around the follicles there was a slight cellular infiltration of small rounded cells, but the connective tissue bundles in the neighbourhood of the follicles were not rarefied and there was no definite evidence of inflammation.

The important features of all three cases were: (1) The plugging of the hair follicles with horny spines over certain regions of the body being most marked on the face, scalp (in two cases), back of the neck, extensor aspect of the arms and buttocks, but occurring also to a greater or less extent in all situations where hair follicles existed, and leading to loss of the eyebrows and eyelashes in all the cases, and almost complete baldness in two of them.

(2) The association of the spiny follicles with general dry and harsh condition of the skin of the type of xeroderma or a mild degree of ichthyosis.

(3) The fact that the condition appeared first in two of the cases during the first year and in the other before the end of the second, all three being reported to have been born with healthy skins.

(4) The absence of definite evidences of inflammation having preceded the growth of the spiny papule, and also the apparent absence of atrophic changes.

The cases suggested an ichthyotic condition in which the mouths of the follicles were specially involved. In some respects they corresponded to cases which have been described by Brocq under the heading of "keratosis pilaris" and by Unna as "keratosis suprafollicularis," differing in the fact that the eyebrows, eyelashes, and scalp were so markedly involved. The absence of atrophy distinguished them from the cases described by Taenzer with the title of "ulerythema ophryogenes."

Mr. Treacher Collins said there was little for him to add to Dr. MacLeod's description. The cases came to him on account of the almost intractable condition of the conjunctivæ, and they had been under his observation for four years. They were suffering from trachoma when

they were first seen by him, and that was now almost cured, but the children still had recurrent attacks of conjunctivitis. He believed that the conjunctivæ were inoculated by means of the handkerchief from the nasal discharge, the absence of eyelashes making it easier for the conjunctivæ to be infected. The condition of the skin had not altered during the four years they had been under his observation.

**A Case of Erythema induratum (Bazin) in a woman, aged 21,
in which a Positive Ophthalmo-tuberculin Reaction had
been obtained.**

By J. M. H. MACLEOD, M.D.

THE patient was a somewhat delicate-looking young woman who worked as a milliner. She had a tuberculous family history, two of her aunts on her mother's side having tuberculosis of the lungs. Three years before she came under the exhibitor's observation lesions of Bazin's disease made their appearance on both legs. These were scraped, but new lesions developed later. At the time of exhibition she presented a number of lesions on both legs consisting of the typical ulcers, reddish-purple patches, deep-seated nodules, and the scars of former lesions. She had no other evidences of tuberculosis. On December 10 a drop of Calmette's tuberculin solution, freshly prepared from the powder, was dropped in the conjunctiva of the right eye near the inner canthus, the eyes having been examined beforehand and proved to be healthy. Six hours later the eye became inflamed, and when she was seen twenty-four hours afterwards an acute reaction had taken place, the lower conjunctiva and the caruncle being red and injected, and an exudation had collected in the inferior conjunctival sac. The eye was so extremely painful and there was such a degree of photophobia that a drop of adrenalin (1 in 1000) and cocaine (2 per cent. solution) were prescribed every six hours to relieve the pain. This reaction in the eye was accompanied by a local reaction in the lesions in the leg, which became definitely painful and appeared to be more vivid in colour. The ophthalmic reaction persisted at its maximum for twenty-four hours longer and then gradually subsided. At the time of exhibition there were still evidences of it.

The CHAIRMAN remarked that some years ago he had had material from a case of Bazin's disease inoculated into a guinea-pig, and the animal had died of tuberculosis. He did not publish the case.

Report on a Case of Infective Granuloma.

DR. STOWERS exhibited for the second time the male patient, aged 48, who was the subject of an infective granuloma of the right cheek of septic origin, in order to show the effects of treatment. The tumour (a description of which has been recorded in the *Proceedings* of this Section—vol. i., no. 1, p. 7) had greatly diminished in size, and was still undergoing a process of resolution. It was decided to continue the mercurial application until the skin had resumed its normal condition.

Dermatological Section.

January 16, 1908.

Dr. RADCLIFFE CROCKER, President of the Section, in the Chair.

Case of Acute Lichen planus.

By E. G. GRAHAM LITTLE, M.D.

THE patient was a young man, a butcher by occupation, with a very extensive eruption, of typical character, covering the greater part of the body and, what was very unusual, much of the face. The eruption was very closely set, of a vivid pink colour, and extremely itchy. The man complained as well of pain in the limbs. No clue to the origin of the disease could be obtained; there was no history of sudden shock or chill, and he appeared to be a fairly robust and healthy subject. The mucous membrane of the mouth was very slightly affected. There were very numerous linearly disposed papules, which had become so distributed by following the course of superficial scratches; a slight linear abrasion of the skin made experimentally by the exhibitor a few days previously was now covered with papules.

Dr. RADCLIFFE CROCKER stated that in his experience the cases which showed most extensive eruption on the body often showed least eruption on the mucous membranes, and vice versa. Cases of this acute type did best on salicin.

Case of Granuloma annulare.

By E. G. GRAHAM LITTLE, M.D.

THE patient was a young woman, of robust appearance, with granulomatous-looking swellings, which the exhibitor showed tentatively as a case of granuloma annulare. The diagnosis was based chiefly on the appearance of the section of one of the nodules. This was shown at the meeting. Its histology was identical with that of a section of granuloma annulare (which was shown for comparison) in a man brought before the

Dermatological Society of London some years ago by the exhibitor; in this latter case the diagnosis was universally accepted. The young woman now shown had had no previous illness; the nodules had begun to appear five months previously, and some of them had left scars. They commenced as white, sago-like swellings, afterwards becoming red and then blue. Nodules of this type were situated on the fingers, wrist, arm, breast, neck, heel, and dorsum of one foot. The exhibitor promised that this case should be tested for tuberculosis, and that a fuller account of it would be published later in the *British Journal of Dermatology*.

Dr. PRINGLE hesitated, on clinical grounds, to accept the exhibitor's diagnosis. He pointed out the presence of deeply pitted scars left where the eruption had subsided. The lesions, which were distinctly nodular, in no locality presented complete circination, and in many positions, most markedly on the backs of the lower part of the legs, no sign of circination whatever. He was of the opinion that the case was probably of tuberculous nature, and suggested the trial of Calmette's ophthalmo-tuberculin test as an aid to diagnosis.

Case of Annular Lichen planus affecting the Penis and Right Forearm.

By J. M. H. MACLEOD, M.D.

THE patient was a fairly healthy-looking man, aged 26, who was employed as a letter sorter. He had enjoyed good health till two years ago, when he had a nervous breakdown and was treated in a hospital for severe pains in the head. He suffered also from a weak peripheral circulation, with cold hands and perspiring feet. He had never had syphilis, was married, and had several healthy children. The eruption about to be described appeared last August, at a time when he was run down and nervous from having to do double work. It was confined to the skin of the penis and right forearm, and consisted of (1) small irregularly shaped papules, about the size of a pin's head, flat-topped, and of a lilac pink tint; (2) larger roundish lesions about the size of a split-pea with a scale in the centre, which, on becoming detached, left a depression; and (3) incomplete ringed lesions with an irregular border, about 2 mm. in breadth, covered with adherent scales, broken transversely by striæ, and enclosing areas of normal or slightly atrophic skin about the size of a threepenny piece. The lesions were superficial, but had a definite and firm consistence. They appeared first as small, flat papules, which increased peripherally, and involuted in the centre with the

formation of a scale, which separated and so produced a ringed lesion. The lesions were associated with slight itching. In addition to the lesions on the penis there was a solitary ringed lesion, about the size of a large split-pea, on the flexor aspect of the left forearm. No lesions occurred on the mucous membranes.

The case was of interest (1) as it showed the method of development of the annular lesion by the peripheral extension of a papule and its central involution, and (2) because the shaft of the penis is a somewhat rare situation for lichen planus. In this connection it is of interest to note that Felix Pinkus¹ has recently described a series of cases of a nodular eruption, with a close resemblance to lichen planus, which occurred in men and was usually confined to the penis, but occasionally affected other parts, such as the abdomen, chest, and arms. He named it "lichen nitidus," as it consisted of shiny papules with a central depression. These lesions never became confluent, but showed a tendency to be arranged in rows.

Dr. PRINGLE had seen on the day of the meeting a case which he had diagnosed six weeks previously as one of lichen annularis, described by Dr. Galloway in 1899 as distinct from lichen planus of annular type. The manifestations were confined to the backs of the hands and wrists, and consisted of numerous circular lesions with raised, firm margins, averaging the size of a sixpenny piece. An eruption of lichen planus papules had, however, developed upon both forearms during the previous week.

Case of Pityriasis rubra pilaris.

By J. A. ORMEROD, M.D.

THE patient was a healthy-looking man, aged 30, and by occupation a coal-heaver. Previous to the onset of the present eruption his skin had been healthy and he could cite no adequate cause for the rash. A month before the outbreak he had attended the Seamen's Hospital for a scalp wound. The first indication he had of the skin affection was that for two days he had noticed that, although working hard, he did not perspire. The skin of his forehead began to feel "tight," and that of the face and neck became red and scaly. The erythema and scalliness had gradually spread down on to the trunk and limbs. He was admitted to St. Bartholomew's Hospital on January 3, 1908, and the onset of the eruption had taken place five weeks before admission. At the time of

¹ *Arch. f. Dermat. u. Syph.*, Wien, 1907, lxxxv., p. 11.

exhibition the eruption had the following distribution and character: It involved almost every part of the skin, but was most marked in the neck, upper arms and trunk. The scalp was slightly scaly, but not seriously affected, the face was red and scaly, while the neck and upper arms were covered with a diffuse, red, harsh, scaly eruption. The vaccination marks stood out as white, unaffected areas. On the abdomen the eruption was profuse, but on each side there were areas arranged symmetrically where the skin was less uniformly involved. On the thighs there were discrete scaly papules, due to the follicles being filled with epithelial plugs. The legs and forearms were less affected, but the follicles were prominent and hard. The backs of the hands were harsh and scaly, but the dorsal aspect of the phalanges did not present the usual prominent follicles. There was slight scaling of the soles and palms, which were horny, but not more so than was usually the case. The scrotum and penis appeared to be unaffected.

Dr. PRINGLE remarked on the remarkably slight degree to which the scalp was affected, but had noted the same peculiarity in two cases of pityriasis rubra pilaris of acute type similar to that exhibited.

Case for Diagnosis.

By H. RADCLIFFE CROCKER, M.D., and GEORGE PERNET.

THE patient was a well-built and otherwise quite healthy male, aged 26, and Australian by birth. Seven years ago, whilst working in very deep mines, he used to get very hot, and he suffered from a rash about the body and inner part of the legs. Some of his mates also suffered from rashes on account of the heat, but in their case the skin soon recovered, whereas in the patient the rash remained for a considerable time, the individual lesions running together and the limbs also becoming involved. Except for an attack of fever in the Gulf of Carpentaria he had always been quite well and strong. He had been under the care of various medical men, some of whom had treated him for syphilis. The question of leprosy and mycosis fungoides had also arisen. In 1906 he came under the observation of Dr. H. G. Anthony, of Chicago, who came to the conclusion that the case was one of parakeratosis variegata, and published an account of it, with histology, and a discussion on the diagnosis.¹

Dr. Anthony sent the patient to Dr. Radcliffe Crocker, but in the latter's absence the case was seen by Mr. George Pernet. The following

¹ *Journ. of Cutan. Dis.*, New York, 1906, xxiv., p. 455.

notes were made on December 4, 1907: Scattered about the body and limbs were a number of patches, circular and more or less oval in shape. On the back the patches varied in size from $2\frac{1}{2}$ in. in diameter to the size of the palm. In colour and general appearance they were a pale pink and yellowish pink, like the early patches of xantho-erythrodermia perstans; but on the front of the body and on the limbs they were mottled brownish and bluish, with intervening hues. The darker ones presented pigmentary changes together with spotty superficial atrophy and telangiectases, especially on the lower limbs and buttocks. On pinching up the patches infiltration could not be made out, and the atrophy was not very obvious to touch. There was but faint scaliness in some of the older patches. As regards the general distribution, there was distinctly a symmetrical tendency, and this became more obvious when a diagram was made of the patches. The lesions, once formed, never went away. There were no symptoms in connection with them. They were not anæsthetic.

Mr. Pernet, when he saw the case, did not agree with the diagnosis of parakeratosis variegata. He proposed to call the condition erythro-atrophodermia perstans en plaques, just to label the case. The condition was possibly related to Brocq's erythrodermies pityriasiques en plaques disséminées (parapsoriasis en plaques), which Brocq considered had some likeness to xantho-erythrodermia perstans.¹ Again, there are the cases of idiopathic atrophy of the skin in circumscribed and multiple patches, the description of which resembles the present patient's condition in some features. According to Rille² the afore-mentioned idiopathic atrophy of skin cases appeared to him to be possibly identical with Brocq's erythrodermies pityriasiques. As the patient had had a variety of treatment, but not X-rays, Mr. Pernet had given the pink patch under the left nipple six exposures, with the result that the patch had practically disappeared, as a comparison with a photograph taken before the X-ray treatment showed. The idea was to treat the pink recent patches in this way and thus prevent, if possible, the atrophic, telangiectatic and pigmentary changes presented by some of the patches.

Dr. Radcliffe Crocker saw the case on his return to town, and agreed that the condition was not parakeratosis variegata, but that in most of its features it corresponded with xantho-erythrodermia perstans,³ the

¹ Brocq, "Traité élém. de Dermat. Pratique," 1907, ii., p. 367; see also Civatte, "Les Parapsoriasis de Brocq," 1906, p. 223.

² Rille, "Encyclop. der Haut- und Geschlechtskrankh.," 1900, p. 214, col. 1.

³ Radcliffe Crocker, *Brit. Journ. Dermat.*, London, 1905, xvii., p. 119. Histological note by George Pernet, p. 134, which compare with Anthony. loc. cit., p. 460.

only real difference being in the mottled pigmented and telangiectatic patches on the front of the trunk and lower limbs, which were not only different from those of xantho-erythrodermia perstans, in which the characters of the patches were very uniform, but from the lesions of any dermatosis with which he was acquainted. He was of opinion the X-rays should be continued. The patches over one hip were now being dealt with in this way.

The patient was admitted to University Hospital in order that he might be kept under careful observation, but as he preferred to attend as an out-patient various points could not be readily gone into.

DISCUSSION.

Dr. J. M. H. MACLEOD said that although the case did not seem to correspond perfectly to any member of the ill-defined group which Dr. Colcott Fox and himself had provisionally named the "resistant maculo-papular scaly erythrodermias," still, it appeared to him to be closely allied to that member of the group which Brocq had designated as "erythrodermie pityriasique en plaques disséminées."

Dr. PRINGLE thought that in the absence of itching and of a tangible amount of infiltration, the diagnosis of a condition of premycosis, which at once suggested itself, could not be established. He was inclined to agree with Dr. Macleod in including it among the inchoate group of affections synthesized by Brocq under the title of "parapsoriasis," but some of its characters resembled those of a severe case of Unna's "eczema seborrhoicum circumscriptum."

Dr. LESLIE ROBERTS regarded it as an example of parakeratosis variegata. He considered that the whole follicular system of the skin was involved, notwithstanding the patchy, discrete character of the eruption. The eruption was not that of a typical seborrhoide.

Case of Lichen planus verrucosus treated by Violet Light.

By H. RADCLIFFE CROCKER and GEORGE PERNET.

THE patient was a man, aged 32, who had had lichen planus on and off for three years, for which he had originally attended at University College Hospital. In 1906 he came for a hard sore and secondary rash, and he had suffered from various manifestations of the specific disease (ulcers on tongue, throat troubles, cutaneous gummata, &c.). On the right leg there were two nearly palm-sized patches of lichen planus, greatly thickened, raised and verrucose, and extremely irritable. In April, 1907, having been uninfluenced to any degree by other means, they were exposed to the violet light obtained by means of the mercurial vapour vacuum tube.

The following were details of the exposures :—

UPPER PATCH MAINLY.				
April 22	5 minutes	} All at 10 in. distance.
" 24	...	...	3 "
" 26	...	...	7 "
" 29	...	...	5 "
May 1	...	...	5 "
" 2	...	...	5 "
" 8	...	...	5 "
" 9	...	...	5 "
" 10	...	...	10 "
" 13	10 "	
" 14	10 "	

LOWER PATCH.				
July 2	10 minutes	} At 8½ in. to 9 in. distance.
" 5	...	...	10 "
" 9	...	...	15 "
" 16	...	...	10 "

For a time after the exposures were stopped in both series little was observed in the patches, except that they felt softer and the irritation ceased. But in the course of a month or so the flattening became accentuated and soon the patches became level with the skin, leaving purplish patches behind, with some thinning of the skin. Mr. Pernet desired to emphasise the importance of not going on indefinitely with the exposures, but to stop them at intervals to observe what time would do.

Case of Tuberculides.

By J. H. SEQUEIRA, M.D.

THE patient, a domestic servant, aged 19, had suffered from an eruption on the skin of the extremities, ears, and face since she was aged 12½. The first appearance coincided with her first menstruation. There had usually been an outbreak each spring and autumn, and the lesions had gradually faded in the intervals. The present attack, which was the most severe, began in January, 1907. Each attack began with an eruption of small, painless, raised, red swellings, which slowly increased in size, projected above the surface, then broke down in the centre and slowly healed, leaving scars.

When first seen seven weeks ago the following conditions were noted : On the backs of the hands, wrists, forearms, and the lower part of the upper arms, and on the front of the legs and feet, were a large number of roughly circular, dull red spots varying from 1 mm. to 2 cm.

in diameter. The margins of the spots could be defined with ease by the finger, but each was surrounded by a rather livid area which shaded into the surrounding healthy skin. In the centre of many spots there was a yellow adherent seat, in others a depressed dry area, and again, in others, an ulcer oozing a little thin yellowish pus. Most of the lesions were discrete, but on the backs of the wrists, and about the elbows, and on the front of the foot and leg, they had in some instances become confluent. The largest ulcers were at the back of the legs. In addition to these active spots there were a large number of small white circular scars, the sites of old lesions of similar type, and also some pigmented spots in the situation of some more recent healed areas. On each cheek there were a few white scars, and on the margin of the lobule of the left ear there was a group of circular infiltrated spots, each showing central necrosis. The right ear was similarly but less severely affected.

When shown at the meeting the ulcerative lesions had almost all healed, the patient having had a prolonged rest in the horizontal position. There was no evidence of tuberculosis in the patient. She had had no serious illness, but "years ago" she had some swelling of the cervical glands. These did not rupture, and there was no scar.

One brother was said to have died of "consumption" (?) when aged 3.

The conditions were those described variously as "folliculitis" and "acnitis," or preferably follicular and papular necrosing tuberculides. The large ulcers were in the calf, and exactly like the ulcers in Bazin's disease. They did not appear, however, to have been preceded by a definite lump, but to have been produced by the extension of the small lesions above mentioned. This the exhibitor could not be certain about as the ulcers were present when he first saw the patient.

The opsonic index to tubercle was tested. It was found to be 1:1. Calmette's ophthalmic test was made and a characteristic reaction obtained. The temperature throughout had been normal. There had been no albuminuria.

Case of Rodent Ulcer.

By J. H. STOWERS, M.D.

THE patient was a bald-headed man, aged 53, the subject of rodent ulcer of about twelve months duration. The lesion, which could be covered by a threepenny piece, was situated upon the left side of the scalp over the fronto-parietal suture. It was painless, but the special

characters of the ulcer supported the diagnosis. No enlargement of glands existed.

Treatment by excision or X-rays was suggested, the majority of the members preferring the latter.

Case of Extensive Psoriasis, with Suppurating Lesions.

By JAMES GALLOWAY, M.D.

THE patient, a woman, aged about 40, had been previously shown at the meeting of the Dermatological Society of London and reported in the *British Journal of Dermatology* (1907, xix., p. 116). She had suffered from extensive psoriasis of very inveterate type, yielding to ordinary methods of treatment only with great difficulty. As the result of the disease and the worries resulting from interference with work, the difficulties of outdoor treatment, &c., she suffered severely in health, and a suppurative condition of the lesions developed in many places, with a tendency to enlargement and suppuration of the lymphatic glands. On account of her loss of strength, loss of weight, and the development of purulent lesions, she was admitted under Dr. Galloway's care at Charing Cross Hospital, and after a period of rest was subjected to treatment by means of inoculation of the "vaccine" prepared from the *Staphylococcus aureus* grown from the lesions on her own skin. The result of this course of treatment appeared to be highly satisfactory. The suppurating lesions disappeared, and shortly afterwards the psoriasis, which had been very extensive, vanished entirely. She left the hospital in June, 1906, and has remained under observation since.

For several months the patient continued to be in good health, and there was very little recrudescence of psoriasis. In the spring of 1907 the psoriasis commenced to recur and soon began to acquire the same type as on previous occasions, being widespread, inveterate, and finally developing a tendency to show purulent lesions in places. Such treatment as could be carried on out of doors had very little effect in controlling the disease. Treatment by the stronger medicaments, such as by chrysarobin, was not borne well, and seemed to spread rather than control the disease. In these circumstances the patient was admitted under Dr. Galloway's care on July 9, with the intention of again carrying out treatment by means of vaccine inoculations. The vaccine was prepared from a growth of *Staphylococcus aureus* grown from the lesions presented by the patient; no other treatment was used. The patient

was kept in bed and had proper and sufficient food, and was washed in the same way as other patients, so as to secure ordinary cleanliness, but no special baths were permitted. In addition to ordinary washing of the body by nurses she was permitted to have one general bath every four days. The following course of inoculations was then carried out:—

			Inoculation : strength of	Index
July	9, 1907	...	200,000,000 cocci	—
"	23 "	...	—	1·06
"	24 "	...	200,000,000 cocci	—
"	31 "	...	—	0·94
August	1 "	...	400,000,000 cocci	—
"	7 "	...	—	1·28
"	22 "	...	—	1·0
"	24 "	...	500,000,000 cocci	—
September	21 "	...	—	1·0

The discomfort after the inoculations was trifling, and only on one occasion, after the injection on August 1, was there any rise of temperature. The temperature on August 1 rose to 99·5° F., on August 2 to 100° F., and then subsided to normal. During the course of treatment thus outlined the patient became steadily worse. The psoriasis spread, assuming the irritable, highly erythematous type characteristic of the case, and towards the middle of September treatment was commenced on ordinary lines, by means, first of all, of soap baths, later by the use of salicylic acid, chrysarobin, and, finally, of chrysophanic inunctions, with the result that the eruption began to disappear. On the date of the meeting the patient was seen to be in good health, and though traces of psoriasis remained on the skin very little was noted, and not enough to produce serious discomfort.

Dr. Galloway brought the case forward in order that he might be able to continue the report of the case previously given. The result could not be described as otherwise than disappointing so far as the use of staphylococcus vaccines is concerned in the treatment of psoriasis. It is true that the case is a complicated one, pus infection to such a degree as shown by this patient being very unusual in the course of psoriasis. The apparently favourable result obtained during the first course of treatment suggested the necessity for an experiment in the way of control. There were difficulties in carrying out the second course, but the steady spread of the disease while the patient was under the influence of treatment by means of vaccine does not appear to lend very much weight to the argument that the psoriasis was cured by the vaccines in the first instance.

Dermatological Section.

February 20, 1908.

Dr. RADCLIFFE CROCKER, President of the Section, in the Chair.

Case of Scleroderma and Leucodermia.

By H. G. ADAMSON, M.D.

THE patient was a girl, aged 16. On the neck and chin on the left side there was a large, irregular area of leucodermia, with a margin of

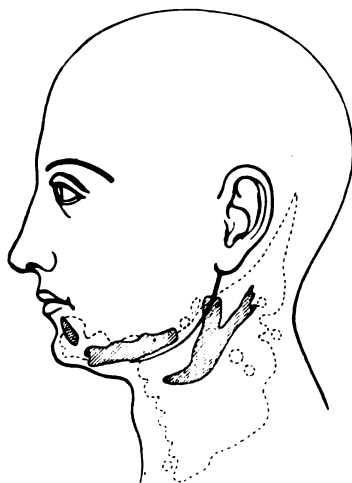


FIG. 1.

Shaded areas, sclerodermia ; dotted line area, leucodermia.

deeper pigmentation and some finger-nail-sized pigment macules over the white area. Occupying part of the same area were three elongated patches of sclerodermia (fig. 1). Apart from the interest of the unusual

association of leucodermia and sclerodermia was the fact that the distribution corresponded very closely with the sensory area of the second and third posterior cervical roots. Towards the chin, however, it overlapped this area and passed on to that of the third division of the fifth cranial.

A diagram of the distribution of the lesions was shown, together with one (after Cushing) showing the sensory area of the second and third segments (fig. 2).

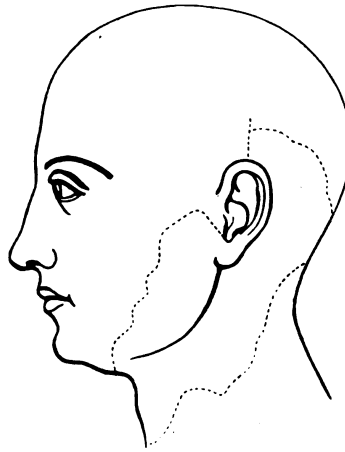


FIG. 2.

Diagram showing segmental area of tactual sensation, from a case in which the posterior root ganglia of second and third cervical were removed for neuralgia. (After Cushing, *Johns Hopkins Hosp. Bull.*, Balt., 1904, xv., 213.)

Case of Telangiectasis of the Cheek.

By H. G. ADAMSON, M.D.

THE patient was a girl, aged 10, who presented on the right cheek a circumscribed patch, 2 in. by $1\frac{1}{2}$ in., made up of a collection of closely set tufts of dilated blood-vessels. The condition had been first noted at the age of a few months as a patch, the size of a finger-nail, which was taken for a bruise. The patch had gradually increased to its present size. The exhibitor regarded the affection as an unusually large "spider-nævus," or, rather, a collection of "spider-nævi." Several members.

however, thought that some of the "tufts" showed also a certain amount of increase of tissue, so that minute nodules could be felt, and the diagnosis of adenoma sebaceum was suggested and a biopsy advised.

The PRESIDENT said that there was more than telangiectasis in this case. One could not tell what such lesions of congenital origin were until they were microscopically examined. He had noticed, also, some atrophic scarring in one or two places.

Case of Lichen plano-pilaris.

By WILFRID S. FOX, M.D.

THE patient, a man, aged 24, was first seen two months ago, when he was suffering from typical lichen planus of six weeks duration, scattered over the limbs and trunk. He was treated with intramuscular injections of atoxyl with the addition of novocaine. The solution contained 20 per cent. of atoxyl for the first two injections, but later a 10 per cent. solution was found more satisfactory. The dose given was 1 c.c. of the stronger solution and 2 c.c. of the weaker, or 20 cg. of atoxyl, twice a week. The papules disappeared rapidly under treatment, and although no local treatment was used the pruritus was entirely relieved after four injections. At the end of ten injections the lesions were in the condition now seen, namely, level with the surrounding skin, the pigmentation alone showing where the papule had been. The patient then showed some toxic signs, such as irritation of the conjunctiva and dyspepsia, and the injections were accordingly stopped. A fortnight after the cessation of the injections the hair follicles over the extensor surfaces of the forearms became inflamed and showed typical lichen spinulosus. There were no signs of arsenical hyperkeratosis.

Five Cases of Lupus erythematosus treated by a New Method.

By T. J. P. HARTIGAN, F.R.C.S.

THE cases brought before the meeting were of the circumscribed variety, sebaceous and telangiectatic in type, and the method employed might fairly be described as new, inasmuch as there was no mention in

literature of the treatment of the condition by ionisation. Bearing in mind the clinical history of the affection and the possibility of its disappearing spontaneously in an unaccountable manner, an isolated instance of improvement counted for very little. He submitted for the consideration of the Section details of five cases, four of them hospital patients, who attended for inspection. In every case a 2 per cent. solution of zinc or copper sulphate was used, preferably the latter, and the result was more prompt and satisfactory than could be obtained by any other form of medication.

M.A.C., female, aged 44. Fifteen months duration, affecting the whole of the nose and slowly spreading on to the adjacent parts. She was treated early in October last year, when the disease rapidly disappeared and has since remained barely recognisable.

A. S., female, aged 27. Twelve years duration, affecting the scalp and face. The patch on the face was treated three times with zinc and once with copper, each application lasting five minutes. Except for a few dilated vessels and atrophy there is nothing now to see.

H. R., male, aged 27. Three years duration, affecting the nose, cheeks, and both ears. Where the disease was treated the efflorescence had disappeared.

A. C., male, aged 35. Three years duration, affecting the nose and both cheeks, also situated in front of the right ear. Situations treated were distinctly blanched.

Mrs. —, aged 47. Fourteen years duration, affecting the face. After one application with copper the lesions were only to be seen faintly, if at all.

The PRESIDENT said the cases were excellent, and the results of the treatment very satisfactory.

Case of *Lupus erythematosus*.

By E. G. GRAHAM LITTLE, M.D.

F. W., AGED 38, with lupus erythematosus, who came under observation for the first time in June, 1906, and then had a very small patch of the disease on the left temple behind the left ear and in the concha of the ear. It had then persisted for twelve months. The diagnosis was by no means clear at that time, and he received no local treatment until he came again, in December of this year, with considerable extension of the

disease. Beiersdorf's salicylic plaster was used, applied continuously, and appeared to benefit the already developed patches, but fresh places made their appearance slowly; in April, 1907, during an exceptionally hot Easter, he got badly sunburnt, and a fresh acute and extensive invasion of the disease took place. These patches were treated at first with lactate of lead lotion until he was able to come to London, in July, when he was put in a home, and constant application was made of soap in the form of soft soap spread on lint cut to the shape of the lesions to be treated; concurrently with this he was given from 12 gr. to 16 gr. of quinine three times daily, for about four to five weeks. The condition improved greatly, most of the patches healing with excellent, almost invisible, scarring. He kept up this treatment at intervals during the latter part of last year and the beginning of this year, and had now had a second period of soft soap plasters in a nursing home for three weeks. Calmette's ophthalmo-tuberculin test had been tried with negative result.

Case of "Ringed Eruption" ("Lichen annularis," "Granuloma annulare" ?).

By E. G. GRAHAM LITTLE, M.D.

THE eruption consisted of two patches situated on the buttocks of a female child, E. C., aged 4. The patch on the right buttock was in the shape of a perfect ring, made up of discrete firm white papules, enclosing an area of skin which appeared darker in colour than normal. The circumference of the ring was $\frac{3}{4}$ in. by $\frac{1}{2}$ in. The other lesion was in the form of a deep-seated nodule in the left buttock, in the fold of the buttock and thigh. This had been excised early in its history, and sections were demonstrated from it at the meeting. Both lesions were quite painless and accompanied by no subjective symptoms; the earliest had persisted for about three months. No other lesions had appeared than these two, and the child was exceptionally plump, rosy and well. The brother of the patient was in the Children's Hospital at the present time, suffering from tuberculous knee; one paternal uncle had died of phthisis when aged 34.

The patient had been under the care of Dr. Fiddes, of Forest Gate, to whom Dr. Little was indebted for seeing the case.

With regard to the case of the young girl shown at the last meeting (p. 33) as an instance of "granuloma annulare," Dr. Little reported that the patient had since been admitted to St. Mary's Hospital, and was diagnosed by his colleague, Dr. Sidney Phillips, to be suffering from early pulmonary phthisis. Her opsonic index to tubercle, taken on several occasions, varied between 0.97 and 1.45, and she had shown a very marked Calmette reaction. But the presence of pulmonary tuberculosis would, perhaps, be sufficient explanation of these findings without assuming that the skin lesions were tuberculous; and the histology of the sections in no way bore out the contention that these were tuberculous. In favour of the diagnosis of granuloma annulare—which had in several reported cases marked association with tuberculous histories—was the fact that the sections from this case could not be distinguished from sections of an undoubted case of granuloma annulare, shown by Dr. Little in 1906 at the Dermatological Society of London.¹

DISCUSSION.

Dr. PRINGLE agreed that it was a case of lichen annularis, but thought it was different from the case which Dr. Little showed last time, and in which tuberculosis had been found.

The PRESIDENT agreed with Dr. Pringle that the case shown by Dr. Little last time was not of the same nature as the present one; the other seemed more like folliculitis. The present one resembled Dr. Galloway's cases of lichen annularis in children and those of granuloma annulare in the adult which he had himself described. But further investigation was necessary; there were some points in the arguments in both directions. He would keep his mind open longer as to whether they were identical with lichen annularis.

Dr. GALLOWAY agreed that there was a difficulty in coming to a conclusion, but thought that those adult cases were different from the cases he had met with in children.

Dr. GRAHAM LITTLE, in reply, said he showed a case two years ago before the Dermatological Society of London, which was accepted by those who saw it as typical granuloma annularis. There were numerous lesions, and he removed two and exhibited sections. The sections from the woman shown at the last meeting were so similar that they were regarded as the same as those shown at the earlier meeting.

¹ *Brit. Journ. of Derm.*, 1906, xviii., p. 117.

Case for Diagnosis.

By E. G. GRAHAM LITTLE, M.D.

THE patient was a little girl, aged ten months, and had been under the observation of the late Dr. John Garrett, of Acton, whose sudden death a few days ago was the cause of the scanty notes in this case. Dr. Garrett had intended to bring the patient to the meeting. The history as obtained from the mother was that the child had had a raised yellowish red patch on the dorsum of the right hand since birth. It was brown at first but had grown redder, without enlarging. Blisters appeared on this raised patch at intervals of four days to a month, usually appearing during the night. She had been seen in November, 1907, by the exhibitor, and had then six blisters on the podalic eminence, the longest being $\frac{1}{2}$ in. across, and containing blood-stained fluid. They usually healed within a few days, and were always confined to the site of the raised patch, which was about $1\frac{1}{2}$ in. in diameter. The blisters had been noted for the first time when aged about seven weeks. The confinement had been easy; it had lasted for four hours and had been a head presentation without requiring instruments.

The exhibitor had tentatively offered the diagnosis of lymphangioma circumscriptum, which was confirmed by the general consensus of the meeting.

In reference to this case Dr. ADAMSON recalled a paper by Moncorvo,¹ entitled "Sur trois nouveaux cas d'éléphantiasis congénital," in which the author suggests the possible streptococcic origin of these cases by infection through the mother, and advocates careful inquiry on the subject of accidents to the mother during pregnancy. It was well known that similar cases of acquired localised swellings or elephantiasis were due to streptococcic infection, and the speaker suggested withdrawing blood by a syringe or taking fluid from a blister for cultivation.

Case of Leuconychia.

By E. G. GRAHAM LITTLE, M.D.

THE patient, aged 17, was a young man apprenticed to a printer, and was in fair general health. A fuller report of this case will be published in a subsequent issue of the *British Journal of Dermatology*.

¹ *Ann. de Dermat. et de Syphilogr.*, 1895, 3^{me} série, vi., p. 965.

Sir MALCOLM MORRIS said he had seen four such cases altogether: one at Buda-Pesth, Unna's case at Hamburg, and two in London. The subjects of it seemed to have a tendency to Raynaud's disease.

Case of Multiple Leiomyoma of the Skin.

By J. M. H. MACLEOD, M.D.

THE patient, a woman, aged 25, had always enjoyed good health and appeared to be robust. The affection began five years ago near the angle of the left cheek, but she could think of no cause which might have been responsible for it. On exhibition she presented a group of about a dozen small discrete nodules, each about the size of a split pea, on the left cheek, extending from about the middle of the cheek to the angle of the jaw. These lesions were rounded and smooth on the surface, and were either oval or round in shape; they were of the same colour as the surrounding skin, but presented a slightly translucent appearance suggesting lymphangiomata. They were solid and almost cartilaginous in consistence, and on being pressed with a diascope became white. Two other lesions, each about the size of a split pea and pink in colour, were present on the right forearm, and a group of three lesions, of the same size and violaceous in tint, was situated on the right leg below the knee. The lesions on the face were accompanied by no subjective symptoms and were not painful on pressure; those on the legs, however, occasionally irritated when she was warm. The only other abnormality which was detected in the skin was the presence of two small pigmented nævi on the nose. There was no history of a similar affection in any other member of her family.

One of the lesions was excised from the leg and proved, on microscopical examination, to be a leiomyoma. A section was demonstrated at the meeting. The tumour mass consisted entirely of long, smooth muscle-cells with the typical strap-shaped nuclei. It was well defined and separated from the epidermis by a thin layer of connective tissue. There was no definite connective tissue capsule to the tumour, and the elastic fibres spread into it for a short distance. Several sections showed that it took its origin from the arrector pili muscles.

The PRESIDENT said he had seen a case very much like it, which was under the care of Dr. Leslie Roberts, of Liverpool. He did not think it could be exactly diagnosed without the microscope.

Case of Lichen spinulosus associated with Seborrhoic Dermatitis.

By J. M. H. MACLEOD, M.D.

THE patient was a healthy little boy, aged 5. The eruption consisted of various-sized groups of spiny papules, situated chiefly about the shoulders, neck, back, and extensor aspects of the arm and thighs. The spines were most noticeable in the lesions about the shoulders and neck, where the lesions were diffusely distributed rather than in definite patches. The lesions about the neck were not inflamed, but those in patches about the back and thighs were pinkish in tint. The eruption was associated with itching, which was most marked when the patient was warm and in bed. In addition to the spiny papules there was a raised well-defined plaque, about the size of a florin, on the back of the left thigh. It was yellowish in the centre and became pinkish at the periphery. The surface was slightly scaly. This patch was considered to be a patch of seborrhoic dermatitis. There was no evidence or history of tuberculosis in the patient or his family to suggest the possibility of the eruption being that of lichen scrofulosorum with spiny lesions. The case was exhibited to demonstrate the occasional association of lichen spinulosus with seborrhoic dermatitis.

DISCUSSION.

The PRESIDENT and Dr. PRINGLE suggested the possibility of the case being one of lichen scrofulosorum with spiny lesions.

Dr. ADAMSON agreed with the exhibitor that it was lichen spinulosus, and not connected with tuberculosis.

Case of Glossitis in a Girl, aged 3½.

By J. M. H. MACLEOD, M.D., and A. N. LEATHEM.

THE eruption consisted of a number of small, ringed, greyish white lesions situated on the upper surface of the tongue. The lesions began as small, slightly indurated papules covered with grey sodden epithelium. These spread peripherally till they reached the size of a threepenny-piece, while the centre became a superficial ulcer. In several instances two or more lesions had coalesced to form gyrate figures. The lesions first

appeared a year ago and had developed gradually since then, none having disappeared spontaneously. The tongue was not definitely thickened, but the borders of the lesions were slightly indurated.

The case was brought forward on account of the difficulty in its diagnosis. It was transferred to the skin department at Charing Cross Hospital for a diagnosis by Mr. Daniel, to whom the exhibitors were indebted for the opportunity of showing the case. The fact that the lesions had persisted showed that it did not belong to the type of "wandering rash" of the tongue, and the presence of slight induration and superficial ulceration suggested a syphilitic origin. There were no stigmata of congenital syphilis present in the patient, and no definite history of syphilis in the mother was obtained. The patient was the sixth child; there was a miscarriage in the fifth pregnancy; the fourth child died when a few months old "with fits," and the first three children were healthy. Mr. Leathem made an examination of scrapings from the surface of one of the ulcers and found various spirochætes, several being indistinguishable from the *Spirochæte pallida*. So far no internal treatment had been prescribed, but it was intended to put the child on antisyphilitic treatment, and it was hoped in this way that the diagnosis would be established.

Case for Diagnosis.

By Sir MALCOLM MORRIS, F.R.C.S.Ed.

(For Dr. KAY.)

THE patient was a man, aged 23, a mathematical scholar, whose home was in Mauritius. He was well until February, 1906, when he had an attack of bronchitis, and was attended by a medical man. For some time after the appearance of the skin affection now seen he took Clark's blood mixture, sarsaparilla, and other things. A medical man diagnosed the condition as molluscum fibrosum, and he was given more iodide. There were some lesions on the arms and legs, but none on the trunk. The eruption was much aggravated by the iodide. He asked for opinions before giving the remainder of the facts of the history.

His own view was that it was leprosy, but there was some difficulty about the eruption. Dr. Wilfrid Fox would test it shortly. He believed a good part of the eruption had been produced by iodide of potassium, and since that and local treatment had been stopped the condition was

much better. Some of the lesions had been vesicular and pustular, and had been watched by Dr. Kay. A careful examination would be made and the result reported to the Section later on. He had had a case of leprosy under his care at St. Mary's Hospital at the time of the tuberculin boom, and injected some, with the result that there was a distinct rise of temperature and the patient was very ill, and lesions came out all over his body. The case was of the nerve variety. After the bullæ subsided there were tumour-like formations in various parts.

DISCUSSION.

The PRESIDENT said it was not unusual to find lepra lesions aggravated by giving iodide of potassium in large doses. Possibly some of the lesions present might be of a transitory character.

Dr. J. GALLOWAY agreed with the remarks of Sir Malcolm Morris. Many of the lesions struck him as due to the iodine which had been taken. The aspect of the patient was suggestive of lepra, and there was some thickening of the ulnar nerves—an exceedingly strong point in the diagnosis.

Two Cases of Elephantiasis græcorum.

By H. RADCLIFFE CROCKER, M.D., and GEORGE PERNET.

CASE I.

THE patient, a woman, aged 23, had already been brought before the Dermatological Society of London. She had been under observation since June, 1907, when the disease was said to have begun three years previously after an attack of enteric fever; pimples and blackheads, according to the patient, making their appearance about the face, and red patches about the body.

The following notes were made at the time she was first seen: The face was of a uniform dusky brown tint, with marked thickening of the cheeks, chin, nostrils and eyebrows. The eyebrows had fallen out, but the eyelids were unaffected. The ears were thickened and had a solid look as a whole, but the lobes were not much more involved than the other parts. The skin of the trunk and upper limbs presented large areas of dusky yellowish discoloration, but with areas of quite healthy skin in between. The hands were somewhat bluish in tint, their dorsal surfaces being swollen and puffy, the solid œdema requiring a good deal of pressure before pitting occurred. The fingers were also swollen and

chilblainy-looking. The legs were rough to the touch, thickened, presented a dusky, yellowish discoloration also, but not so obvious as on the upper limbs. The dorsal surfaces of the feet were swollen and œdematous like the hands, with a dry, reddish-brown condition of the skin reaching halfway up the fronts of the tibiæ. There was no thickening of the nerves. The skin, both of and away from discoloured areas, was hyperæsthetic.

The treatment had been at first Chaulmoogra oil by the mouth in increasing doses, which the patient had stood well. In August, 1907, intramuscular injections of soziodolate of mercury $\frac{1}{4}$ gr. were also employed concurrently with the Chaulmoogra. Improvement occurred, especially as regards the general condition, the patient becoming more cheerful and better in health. But in December, 1907, she had a febrile attack, influenza-like (influenza epidemic at the time), but, of course, febrile attacks are well known to occur in the course of the complaint, and it may have been of that nature. An effervescing quinine mixture was ordered and the other treatment interrupted. When she had recovered from this febrile attack it was found that the Chaulmoogra oil upset her, even in small doses. The intramuscular injections were resumed.

More recently the patient had another febrile attack, which gave way to quinine. It was then decided to give her intramuscular injections of Chaulmoogra (in accordance with Tourtoulis Bey's experience, and also Jeanselme's), but Captain Rost, I.M.S., of Rangoon, having very kindly offered to supply leprolin, the patient was then under the latter in intramuscular injections. Up to now she had had two injections. The further progress of the case would be reported to the Section.

CASE II.

THE patient was a man, aged 44, in whom the disease had commenced six years previously on the right parietal region, and had slowly extended from the scalp on the temple and forehead almost as far as the supra-orbital notch. The older lesions had undergone involution, leaving loss of hair in patches and finger-tip depressions with nodular infiltration of the borders over the parietal region. The present active lesions had been present some three or four months, and were situated on the right temple and supra-orbital region. They formed dull red nodules in the skin, about $\frac{1}{3}$ in. diameter, firm to the

touch, and aggregated together in irregular groups. On the supra-orbital region the nodules have coalesced into an infiltration of 1 sq. in. with a few isolated nodules above them, where a chain of nodules was also present. There was another chain of nodules extending into an irregular segment of a ring, reaching as far as the outer angle of the orbit. There were no lesions in any other part of the body except the right groin, in which situation there was an irregular ring of nodules, about $1\frac{1}{2}$ in. in diameter and of the same general character, but less marked in size, colour, and induration. In both situations the patient spoke very positively as to the sensation to a prick being distinctly diminished. There was no enlargement of nerves. The patient has been in the West Indies, Bermuda, Halifax (N.S.), and South Africa. He left the West Indies in 1891 and was in South Africa from that date. Neither Mr. Pernet nor Dr. Thiele, Pathologist to University College Hospital, had found the bacilli of Hansen in serum from a forehead nodule, but a further search would be made, and, if possible, a biopsy obtained.

The patient had only just come under observation, and as the case was unusual he had been shown to the Section. The facts pointed to the condition being probably one of elephantiasis græcorum, but it was proposed to put the patient on antisyphilitic treatment and to watch its effects.

Although the bacillus of Hansen had not been found at the first examination such a negative result was not conclusively against elephantiasis græcorum. The serum would again be examined, and if possible sections of a nodule cut and stained. In Dr. J. Ashburton Thompson's Report for New South Wales (year 1906) the bacillus had not been found in some cases in which one would have expected to find it. The scalp was very rarely involved in leprosy, but Mr. Pernet had recorded two nodular cases (advanced cases, be it noted) in which this complication had occurred.¹

If the cases exhibited this afternoon turned out to be undoubtedly elephantiasis græcorum, the fact that the disease commenced in the scalp would therefore be very exceptional.

DISCUSSION.

Dr. COLCOTT FOX said he thought the diagnosis of syphilis should be considered in the case of the soldier.

¹ Pernet, *Brit. Med. Journ.*, 1905, ii., p. 1280.

Dr. WHITFIELD asked whether the bacilli of leprosy were found in the doubtful case. If not, he thought that would negative that diagnosis, as they were found so easily, even at an early stage, if that were the disease.

The PRESIDENT said that further investigations on the point would be made. In the case of the lady, Dr. Rost's leprolin had been tried, and he asked Dr. Rost to refer to it.

Dr. ROST said that four years ago he started to treat cases of leprosy by a substance which, in its reaction, was like tuberculin. He excised the under part of nodules of leprosy and soaked them in a medium of volatile alkaloids. A six weeks incubation followed, and then the material was reduced with sulphuric acid and other substances. On injecting this into the patient the nodules swelled up, and, as a rule, sensation returned afterwards. About forty cases had been treated in Rangoon, and now there were no signs of the original disease. The injections were usually given at intervals of a week. The present case had had two injections.

Dr. PRINGLE thought that anyone seeing the ears of the lady and Dr. Kay's patient would agree that they were suffering from the same disease, though Sir Malcolm Morris's argument in favour of there being a complication in the case of the man from Mauritius was very sound.

Mr. PERNET said there were fibrous changes taking place in leprosy, and it was sometimes necessary to make several examinations before being sure there were no bacilli. He felt no doubt about the case of the man being one of leprosy, seeing the condition of the eyebrows, the ear, and the ulnar nerves. Iodide of potassium, even in small quantities, was very poisonous to leprosy patients, and he had seen purpuric rashes develop in consequence.

Senile Warts developing into Fungating Growths.

By H. RADCLIFFE CROCKER, M.D., and GEORGE PERNET.

THE patient was a man, aged 73, in whom the disease had been going on for three years. When first seen on January 31, 1908, there were several fungating crusted growths about the face, one of which occupied the greater part of the nose. Scattered about here and there were also a number of dirty warty growths in various stages of development, some small ones of recent origin. On removing the crusts reddened, raised, fungating, softish, oozing masses were found, without induration of any kind at the borders. Some of the smaller ones were frambæiform in appearance.

Dr. Radcliffe Crocker showed a coloured drawing of the man's condition at the time of his admission to hospital. Mr. Pernet had thoroughly sharp-spooned all the growths, followed by the application

of pure phenol, under an anæsthetic, and, as could be seen, the patient was doing very well.

Mr. Cowell, house physician at University College Hospital, had, on his own initiative, cut some sections of debris, and these were exhibited at the meeting. Since then, at Mr. Pernet's suggestion, Mr. Cowell had stained some more sections by the Pappenheim-Unna method. Mr. Pernet had examined some of these sections and had found they confirmed his view as to the granulomatous nature of the growths, the sections showing numberless plasma-cells, in parts very crowded together, and building up the greater part of the growth. The sections also showed that the papillæ and epidermal downgrowths were elongated, the sebaceous glands compressed, and their main normal characters greatly altered, with some increase in growth of their skeletal network, and the vessels dilated. Cellular exudation was also present. There was no evidence in support of an endotheliomatous structure as suggested originally by Mr. Cowell, to whom the exhibitors were indebted for the opportunity of examining sections. Mr. Pernet considered that the histological appearances resembled those of advanced fungating yaws lesions, and supported the view that such yaws lesions were really the result of secondary infection.¹ Thus a framboesiform appearance might arise in various morbid conditions such as the present one, yaws and syphilis for instance.

Case for Diagnosis.

By J. H. SEQUEIRA, M.D.

DR. SEQUEIRA showed a negro with a large granulomatous tumour at the left angle of the mouth and a penile ulcer with infiltrative swellings in the right groin. The patient, a seafaring man, aged 26, was born in Antigua, and he had spent most of his time in Jamaica and other West Indian islands. He was sent to Dr. Sequeira from the West Ham Infirmary by Dr. Culpin. The history given was that the tumour at the angle of the mouth had developed in eight months, and that the swelling in the groin was of the same duration, but that the penile ulcer had only been present four weeks. The tumour at the angle of the mouth at first sight suggested an epithelioma; it extended from the upper to the lower lip around the buccal orifice. In its extreme

¹ Pernet, "Differential Diagnosis of Syphilitic and Non-syphilitic Affections of the Skin," 1904, p. 152.

width it measured $1\frac{1}{4}$ in. and formed a horseshoe-shaped swelling around the left side of the mouth. It was of a florid red colour, making a startling contrast against the black skin of the patient. The tumour was soft to the touch and vascular. There was very little glandular enlargement.

The ulcer on the penis was on the skin of the dorsum. It was almost triangular in shape, and presented little infiltration. There were other scars of (probably) similar ulcers on the penis. In the right groin there was a peculiar linear infiltration following Poupart's ligament. In parts this infiltration had broken down to ulceration, but in its greater extent it was of a peculiar tough character.

Dr. Daniels, who kindly saw the case for the exhibitor, agreed that the penile and groin condition was a well-recognised venereal, but not syphilitic, "ulcerative, or rather sclerosing, granuloma of the pudenda" seen in the West Indies. In his experience, and so far as could be gathered from an examination of the literature, the tumour on the mouth was unique. It was mentioned that similar conditions had been seen about the anus. Microscopical examination showed the tumour to be a granuloma; examination for spirochætæ had been negative.

DISCUSSION.

Dr. GALLOWAY said he did not remember seeing or reading about a case of granuloma inguinale affecting the region about the mouth. Some cases had been recorded in which it appeared in the axilla and in other places as well. Colonel Maitland, I.M.S., reported several cases of the disease.

The PRESIDENT said that if the patient had not been a native of the West Indies, as the lesion was quite soft, one would probably have diagnosed epithelioma.

Dr. J. M. H. MACLEOD said that, in the case of granuloma pudendi which he had exhibited at the Dermatological Society of London,¹ a number of exposures to X-rays had been given, using one-third of a Sabouraud pastille dose once a week for about two months. As a result the diseased tissue dried up and shrivelled, and the affected area diminished. It was then scraped at the Military Hospital at Rochester Row, and Colonel Lambkin, R.A.M.C., reported that the diseased tissue, instead of being tough, as is usually the case, had become friable and was easily removed. The patient was seen by Dr. Macleod after the wound had healed, and the result was excellent; the whole of the diseased tissue appeared to have been removed and a healthy scar left. In this case the disease did not spread up into the rectum, which it frequently does, and hence the opportunity for complete extirpation was a good one.

¹ *Brit. Journ. of Derm.*, 1907, xix., p. 73.

Case of Hæmangiectatic Hypertrophy of the Foot, possibly of Spinal Origin.

By F. PARKES WEBER, M.D.

THE patient was a motor driver, aged 19, whose left foot was decidedly larger than his right foot and of a red or bluish red colour, as if turgid with blood. The skin over part of the foot, especially over the dorsum, was closely studded with small projecting bluish venous loops (varices), and so also, though to a lesser degree, was the skin over the knee-cap of the same extremity. The calf muscles and other muscles of the leg were about equally developed on the two sides, but there was considerable wasting of the left thigh and buttock, and ankylosis of the left hip-joint. The two lower extremities were about equal in length. The knee-jerks and plantar reflexes were natural and there was no ankle-clonus on either side. The pulsation in the dorsalis pedis artery was well felt in both feet. There was no anæsthesia to touch, pain, heat or cold, and the reactions of the muscles to galvanism were normal. There was considerable kyphosis in the dorsal region of the spinal column. There was no evidence of any disease in the thoracic or abdominal viscera or elsewhere in the body. Dr. Archibald D. Reid has taken Röntgen photographs of the feet and hip-joints. They showed that the hypertrophy of the left foot was practically confined to the soft parts and that there was bony ankylosis of the left hip-joint (of doubtful origin). The history was that about two years ago the patient complained of pain in the back of the left thigh. He was at first treated for sciatica, and was afterwards supposed to have hip disease and wore a Thomas's splint for eighteen months. The hæmangiectatic hypertrophy of the left foot and the wasting of the thigh muscles, &c., had developed during the last two years, but the kyphosis of the dorsal region had existed to some extent previously, though it seemed to have increased during the last two years. He had experienced no pain in connection with the changes in the lower extremity excepting the pain at the back of the thigh about two years ago. Dr. Weber thought that the condition of the foot was of vaso-motor origin (vaso-constrictor paralysis?), possibly connected with some organic change in the spinal cord. Under the term "hæmangiectatic hypertrophy" Dr. Weber wished also to include certain cases of congenital or developmental enlargement of one lower extremity in children, which

he had described in an article¹ on "Angioma Formation in Connection with Hypertrophy of Limbs." Hæmangiectatic hypertrophy was to be distinguished from other enlargements of the lower extremities, such as congenital and acquired "trophœdema," so-called "elephantiasis" (due to chronic or recurrent lymphangitis and lymphatic obstruction), and typical "giant-foot."

Case of Macular Atrophy of the Scalp (Pseudo-pelade of Brocq).

By A. WHITFIELD, M.D.

THE patient was a young man, aged 26. The disease had begun somewhat acutely about four months previous to exhibition and affected most of the top of the head, more especially on the left side. Sections were shown to demonstrate the anatomical condition present, and it was hoped to publish the case in detail later on.

DISCUSSION.

The PRESIDENT said he had not seen many such cases, but he thought the clinical diagnosis was clear. Bunch, he believed, had found some kind of coccus associated with it, not the pus coccus. He (Dr. Crocker) regarded it as an infective follicular disease from the clinical standpoint. The cases were very consistent in their characters—the easy way in which the hairs could be pulled out, and the swollen root sheath. But he agreed that clinical evidence of inflammation around was often absent; he had seen a very trifling evidence of it in a few cases.

Sir MALCOLM MORRIS said he showed a case which was thought to be of the same nature, and everybody present agreed. But some months afterwards, after careful investigation, favus was discovered. The outer angle of the eyebrows was affected in all cases.

Dr. PRINGLE said he thought that a case he had some months ago was an example of the condition, but he noticed some suspicious scurf about the margin. He accepted Dr. Whitfield's diagnosis in the present case, as he had a very marked instance of it which he showed before the Dermatological Society of London. He sent it over to Paris, and Brocq confirmed it. The growths were sterile; there was nothing abnormal found.

Dr. WHITFIELD, in reply, said the patient's doctor had given him chrysa-robin, and apparently the condition stopped. But it sometimes did so automatically. The question of favus in the case had been investigated. In some cases it gradually spread over the head in patches, in which the hair was not denuded but only thinned. Sabouraud had found all such cases sterile.

¹ *Brit. Journ. of Derm.*, 1907, xix., p. 231.

**A New Substance for Shielding those parts of the Scalp
which it is not wished to expose in the Treatment of
Ringworm by means of the X-rays.**

By A. WHITFIELD, M.D.

THE idea of the substance was derived from the modelling clay known as Harbutt's plasticine, which itself was only partially obstructive to the rays. It had been proposed by Dr. Whitfield to have made a similar substance, but made with lead oxide instead of clay. On consulting Professor Jackson, of King's College, Dr. Whitfield was advised to try barium sulphate as being entirely non-toxic if any should get on the hands.

Accordingly Messrs. Hopkins and Williams had made the substance exhibited, and although it was thought that further improvements might be made, Dr. Whitfield thought that even the substance exhibited was a distinct advance on the ordinary lead shield. The material was made by incorporating by means of machinery coarse barium sulphate with vaseline so as to form a kind of putty. It was grey in colour and quite plastic, so that one could mould it on to the scalp with the greatest ease, and it therefore did away with most of the trouble in fitting masks. If bent too sharply the material would crack, but none of the curves of the scalp were acute enough to give any trouble in this direction. It was rather sticky to roll out, but Dr. Whitfield had found that by placing it between two pieces of grease-proof paper it could be rolled out with ease. A thickness of $\frac{1}{4}$ in. was so opaque that one could not detect the blade of a knife behind it with the fluorescent screen. The material was also exceedingly cheap, so that if there was any difficulty in sterilising it new material could be used each time. If, owing to high room-temperature, there was the slightest stickiness, it could be dusted over with boric acid, which was transparent and would not obstruct the rays when the turn came for the part previously screened to be exposed, or the material could be laid on a single layer of ordinary gauze, which could be stretched over the head. Mr. Edmund White, who had kindly undertaken the experimental manufacture of the substance at Messrs. Hopkins and Williams's, was still at work trying to improve the consistency, but at present it worked very satisfactorily.

Case of Rodent Ulcer of the Ala Nasi in a Man, aged 36.

By A. WINKELRIED WILLIAMS, M.B.

THE point of interest in this case was the absence of any distinct border. The ulcer had a clean punched-out appearance, making the diagnosis rather difficult. The history, however, showed that it began as a hard lump which ulcerated and has existed for eighteen months. There was a history of syphilis six years ago, but antisyphilitic treatment had been tried for the ulcer without avail. The case was to be treated by X-rays.

The PRESIDENT agreed with the exhibitor that it was probably rodent ulcer.

Dermatological Section.

March 19, 1908.

Dr. RADCLIFFE CROCKER, President of the Section, in the Chair.

Case of Pustular Ringworm of the Horse ("Conglomerate Folliculitis") in a Child.

By H. G. ADAMSON, M.D.

THE patient was a boy, aged 2, who presented on the front of the right leg below the knee a circular patch 3 in. in diameter, red, deeply infiltrated, and studded with pin-head-sized pustules. The appearances had at once suggested ringworm of the horse, though it was unusual to meet with this type of ringworm in a child. The father of the child was a harness maker, and often received old harness for repairs. Pus from an unbroken pustule showed chains of very large, oval, and rounded spores—quite unlike the segmented mycelial threads of the vesicular "cat ringworm" of children—and cultures gave the typical plastery white, rapidly growing culture of *Tricophyton megalosporon ectothrix du cheval à cultures blanches*. The exhibitor had seen two examples of this type of horse ringworm in ostlers on the arm and two cases on the beard region, but had not previously met with a case in a child.

Case of Urticaria pigmentosa.

By H. G. ADAMSON, M.D.

THE patient was a boy, aged 2½, with urticaria pigmentosa of the macular type. The child had been quite clear until aged about six months. He had then been troubled with itching patches which "looked exactly like insect bites." They were pink, raised, and with a central darker "spot"; when the pink colour faded there remained a

brown patch. The brown patches had persisted, and fresh ones had appeared. Now there were about sixty in all—forty on the front of the body, chiefly on the chest and abdomen, and about twenty on the back. There were a few lesions also on the thighs and legs. Factitious urticaria was well marked. After briskly rubbing the patches for a few minutes they became inflamed and surrounded by a pink, raised, sharply margined wheal. The patient had been brought to the hospital on account of its restlessness at night, when the lesions became urticarial.

DISCUSSION.

Dr. SAVILL asked whether calcium chloride had been tried. He had had one or two cases of urticaria pigmentosa which had been improved by it.

Dr. ADAMSON replied that he had not had the opportunity of trying it as the patient had not been under his care more than a week. In four or five other cases he had tried salicin, and it seemed to control the urticaria; he had not tried calcium chloride.

Case of Favus in a Mouse.

Shown by T. P. BEDDOES, F.R.C.S.

(For Dr. ABRAHAM.)

THE mouse was brought by a patient, a man, aged 43, who came two weeks ago with typical parasitic sycosis, which he had had for one month, forming a raised patch on the chin $\frac{1}{2}$ in. in diameter with swollen follicles. Immediate examination showed large spore mycelium in the sheath of the hair. The patient was in the habit of being shaved by a barber. He stated that one of his three children three months ago had a sore patch on the chin which had been cured by vaseline.

The patient to-day brought his child, whose skin was quite normal, and a dead mouse (the specimen exhibited) caught by patient's wife with her hand four days ago; it lived two days. It showed hard, white, much raised crusts on the ears and forehead without any characteristic smell. The mycelium under the microscope was indistinguishable from favus.

Dr. Abraham considered that the man had typical *tinea barbæ* due to a trichophyton and that the mouse had favus, and that the two were simply a coincidence. To make sure of this further examination with cultures would be made.

Case of Ringed Eruption on the Hand.

By G. W. DAWSON, F.R.C.S.I.

THE patient was a young man, aged 22, with a ringed eruption about $1\frac{1}{2}$ in. in diameter on the middle knuckle of the left hand. The ring consisted of a number of isolated, flat, clearly defined papules of the same colour as the skin. They were slightly depressed in the centre, hard, and rose abruptly from the skin. One of them was broken up into five wedge-shaped portions. The eruption began seven years ago on the apex of the knuckle, and the patient stated that each papule gradually enlarged, broke into several portions, and finally disappeared in four or five months, leaving apparently normal skin. Others then developed outside this area and underwent the same cycle of changes.

Microscopic examination disclosed swelling of the cells of the stratum mucosum and marked enlargement of the sweat glands and ducts.

DISCUSSION.

The PRESIDENT (Dr. Radcliffe Crocker) said that it was not typical lichen annularis; there was a lichen planus look about the present lesions. The first case he published he described as lichen planus-like lupus erythematosus.

Dr. GALLOWAY considered it a case of lichen annularis, and said that the case reminded him of one in a lady who was under observation for several years, in which case the lesions, as they died away, became concave and very flat.

Dr. GRAHAM LITTLE said he thought it was granuloma annulare. The characteristic points were the hardness and whiteness of the papules, their umbilication, and the fact that they were very chronic and occasionally disappeared. At St. Mary's Hospital he had a man under care for six months with a continuous crop of similar lesions; they were first white and then red. The section shown did not go very deep in the skin and the sweat coils were not well seen, so that it was impossible to pronounce an opinion on this factor.

Mr. G. PERNET said he had maintained that lichen annularis was the same thing as granuloma annulare. He had examined histologically a case which was brought forward by Dr. Crocker and satisfied himself on the point.

Case of Bilateral Telangiectases of the Trunk with a History of Marked Epistaxis in Childhood and recent Rectal Hæmorrhage.

By T. COLCOTT FOX, M.B.

THE patient, E. B., aged 23, engaged in housework, was sent to me by Dr. John Norton on account of peculiar telangiectases, and was subsequently admitted to the Westminster Hospital under the care of Dr. Hebb, from December 12 to 23, 1907, and again from February 18 to March 14, 1908. I am greatly indebted to Dr. Hebb for allowing me to report the case with the use of the notes.

The family history obtained was that the patient's father died, aged 63, of "heart failure," and the mother, aged 60, who had bleeding piles, of "dropsy." A brother of the father is said to have died of pulmonary tuberculosis, and also the mother's two sisters. One brother of the patient was killed by lightning and another suffers from "fits," dating from an injury behind the ear. A living sister has a discharging, non-bleeding "tumour" on the back of her neck, and a brother and sister have consumption. No evidence was forthcoming of hæmophilia or marked epistaxis.

The personal history of the patient discloses an attack of measles in childhood, mumps when aged 12, and "ulcerated throat" of about a week's duration when aged 15. When aged 10 she had considerable epistaxis from both nostrils almost every morning for six months, and at 14 she noticed some red spots in the left lower axillary region, and later on the left back, right lower axillary region, and lower part of chest. These spots have gradually increased in number and appeared on a wider area. There is some occasional itching. The menses commenced when aged 18 and are now regular in time, but marked by much pelvic pain a day prior to the commencement of the flow, which is copious and makes her feel weak and short of breath, and her hands and feet cold and numb. For the last six months at least, and especially after standing, she has noticed that her hands, especially the left, go cold and blue, with pallor of the finger-tips and nails, and a tight sensation of these parts. She has had some leucorrhœa for a year past. In the summer of 1907, when walking about, her attention was attracted by bleeding from the

rectum, lasting about half an hour, and accompanied by a sensation of swimming in the head and pain in the lower part of the abdomen and bottom of the back. The blood was dark red and in part clotted. Three months later she had a similar attack, and every week has passed a little blood and matter. On December 6, 1907, she had a marked rectal hæmorrhage of bright blood, continuing for about four hours. The patient has always been constipated, and generally loses a little blood when she goes to stool. On December 27 a passage of about half a pint of dark blood occurred from the rectum in about a quarter of an hour. The next week and the week after there were similar occurrences, and again on February 16, always whilst walking. She states that recently, after walking about a mile, she loses vigour in her legs, especially the right, and experiences a pain in the region of the right buttock, back and outside of thigh down the back of the leg to the ankle, and she remembers that last midsummer she slipped and fell on the right hip. The patient does not bleed unduly from cuts, and she is not subject to blood effusions in the skin. She has had teeth extracted from time to time without any unusual hæmorrhage. On two occasions the rough usage of a bath-towel has caused some oozing of blood for a couple of hours from the dilated vessels.

The patient is a well-formed, healthy-looking girl, with slightly cyanotic hands and coloured cheeks and rather slow pulse (54 per minute). The tongue is slightly coated. Disseminated without special order over the lower two-thirds of the trunk, behind and at the sides, with predominance on the left side, there is a fairly copious purple eruption simulating small hæmorrhages into the skin (fig. 1). On close examination these eruptive lesions are seen to be dilated capillary blood-vessels, punctate at first appearance and gradually conglomerating to form slightly raised papule-like spots, about half the size of a split pea. They do not disappear by pressure. An isolated spot is situated on the skin outside the right eye. It is to be noted also that the patient has several soft moles on the face and limbs. She complains of some tenderness down the whole length of the right sciatic nerve, extending down the back of the leg below the knee to the ankle. The knee-jerks are equal, and the plantar reflexes almost absent.

Whilst under observation in the hospital there was no febrile disturbance, and nothing wrong could be detected in the various viscera, including the kidneys. Mr. Hartridge reported that the eyes were normal, and Mr. de Santi examined the nose and throat and failed to find any indication of enlarged blood-vessels, only some adhesion between the

inferior turbinate and septum nasi. Mr. Carling made, under anæsthesia, an examination with the sigmoidoscope of the lower bowel for about 12 in., and found the mucous membrane normal. Two examinations of the blood were carried out. On December 13, 1907, the report was: Proportion of serum to corpuscles obtained by centrifuging, 2 : 3; hæmoglobin, 85 per cent.; red blood-corpuscles, 4,600,000; white blood-corpuscles, 5,700. Polymorphs, 49 per cent. (fine granules 48, coarse 1).



FIG. 1.

Telangiectases of the trunk and moles on the arm and face.

Monomorphs, 51 per cent. (large 8, transitional 23, small 20). Coagulation time, three minutes and fifty seconds, and the same on December 19.

On March 10, 1908, the red corpuscles were 5,500,000, the hæmoglobin 92 per cent., and the proportion of serum to corpuscles 1 : 1. A

biopsy was made of a little cluster of the eruption of the back, and the sections display the dilation of blood-capillaries without any other changes (fig. 2). I am greatly indebted to Dr. H. G. Adamson for the drawing of the section.

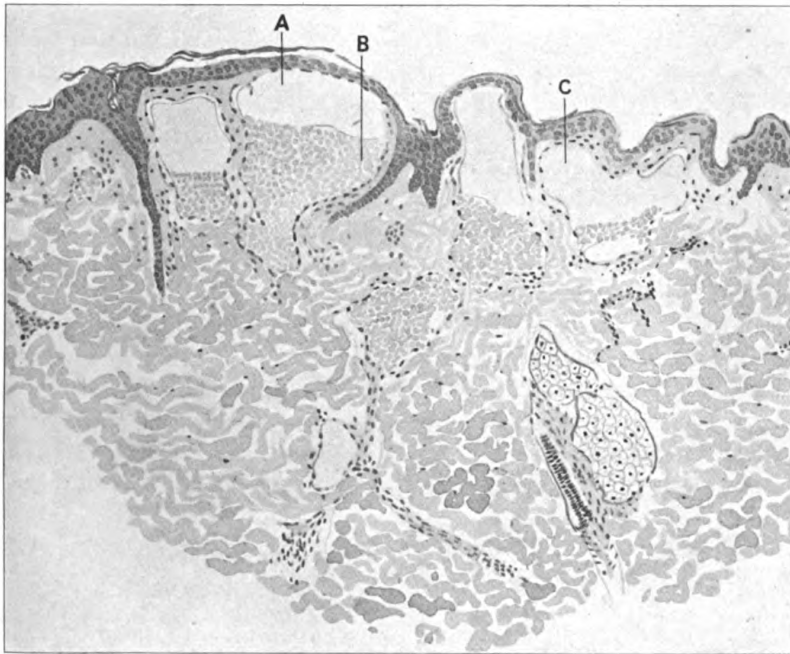


FIG. 2.

Section of Telangiectases from the back.

(A) Serum. (B) Blood-corpuscles. (C) Dilated capillary.

DISCUSSION.

The PRESIDENT said he had seen warts develop from such conditions, but not true angioma. He understood that there were no lymphatic vesicles.

Mr. COLCOTT FOX, in reply, said he would discuss the subject in a paper in the *Journal of Dermatology*. Politzer, in his "International Atlas of Rare Skin Diseases," reported a remarkable case of the kind all over the body, and called it *nævus*, as it occurred in very early life. The present patient had a number of moles. It began when aged 14, and she was now 23.

Case for Diagnosis.

By WILFRID S. FOX, M.D.

THE patient was a girl, aged 18, who was suffering from two shallow ulcers; one, situated on the chest just to the left of the sternum, had been present for a month; the other, on the outer side of the left knee, appeared only a fortnight ago. Both ulcers were similar in appearance, measuring about 2 in. in diameter, the surface being covered by a dry, semi-transparent parchment-like substance, through which the superficial veins could be seen. A year and a half previously she had cut her hand with a kitchen knife and the wound had become septic, and only recently healed.

The exhibitor said he had questioned the patient with regard to the artificial production of the ulcers, but had failed to get any confession. She was a very quiet, sensible girl, not in the least hysterical, and answered questions readily.

The general opinion of the members was, however, that the lesions had been caused by artificial means.

DISCUSSION.

The PRESIDENT said he thought all would agree as to the factitious nature of the lesions, which were on the left side, especially taken in conjunction with the general aspect of the lady. The question was as to the agent employed; unless the lesions were seen fresh it was difficult to determine that. Acid, vinegar, or mustard might be used. He was once called to a provincial town to make a diagnosis in such a case, and suggested toilet vinegar as the agent. It turned out to be a mixture of toilet vinegar and Jeyes' fluid. The same patient used to have morphia suppositories and take them by the mouth.

Dr. PRINGLE said it was surprising what could be done by merely wetting the finger and rubbing it on the skin. He had a patient in hospital for more than a month and she did it at night, although there was a night nurse watching her.

Dr. WHITFIELD suggested that either hydrochloric or acetic acid was the probable cause.

Case of Acute Scarlatiniform Eruption following the Administration of Small Doses of Quinine.

By J. GALLOWAY, M.D.

(In association with Dr. COHEN.)

THE patient was a man, aged about 27, of Jewish race, pallid in complexion and unduly stout for his years. He came of a family in which there was a marked history of glycosuria. In his own case, however, glucose had not been identified in the urine, though marked phosphaturia had been observed. He suffered from a tendency to seborrhoic troubles with slight scaly dermatitis of the scalp, which had been eczematous on two occasions, two and three years ago.

Twelve months ago, feeling a little run down in health, he had taken $\frac{1}{2}$ oz. of the proprietary medicine known as Phosferine. Within two hours he suffered from symptoms of faintness with a sensation of choking, feverishness, followed by a violent scarlet blush over the whole body, including the face and extremities. The most severe symptoms began to subside in the course of a day or two, but were followed by well-marked desquamation, which lasted for some time. A fortnight ago, once more finding it advisable to take a tonic medicine, he visited a house of public entertainment and obtained a bottle of what was called "tonic water." This he drank, hoping to benefit. Within two hours he again experienced the exceedingly uncomfortable and distressing symptoms with which he had become familiar twelve months previously after the dose of Phosferine.

The desquamation had not completely ceased when he consulted Dr. Cohen on March 14, complaining of neuralgia affecting the right side of the face. There were present one or two carious teeth, and until these were properly attended to by the dentist, Dr. Cohen prescribed for him a medicine containing 1 gr. of quinine to the dose. He took a dose of this medicine at 3 o'clock on Saturday afternoon. At 6 o'clock the symptoms now familiar to him were fully developed. The temperature was 102° F. He experienced shivering, marked nervous depression; the tongue became very furred; he had "foaming at the mouth," the fauces were swollen, there was much difficulty in swallowing, and the

patient not only felt seriously ill, but had all the aspects of a serious and acute disease.

On Wednesday, March 18, he was taken by Dr. Cohen to see Dr. Galloway. The patient was now much more comfortable, the acuter symptoms of the attack having to a great extent disappeared. He still presented over large areas of the body, especially the lower part of the abdomen, the inner side of the thighs, and the inner surfaces of the arms, a bright scarlet eruption, now becoming patchy. The whole body, during the acute attack of the previous Saturday and Sunday, had been covered with this acute erythema. Over considerable areas a large quantity of superficial desquamation of epithelium could be observed; the face was as if powdered, owing to this desquamation, and a good deal of scaliness of the scalp existed, complicated, however, by the previously existing seborrheic pityriasis.

Dr. Galloway drew the attention of the Society to the fact that Phosferine contained the phosphate of quinine, and that the bitter tonic water which was now frequently sold as a form of aerated beverage also contained quinine in small quantities. The key to the problem, however, had been given when the prescription of 1 gr. of quinine was immediately followed by the acute form of quinine erythema which they now witnessed. Dr. Galloway remarked upon the comparative rarity of the scarlatiniform type of quinine eruption. Its features, however, were of so striking a character and the illness which they provoked was so severe that its existence was well recognised. Numerous cases were on record, and he referred especially to the case described by Dr. H. W. Stelwagon.¹

This unhappy patient had been reduced to such a condition by repeated attacks of the scarlatiniform quinine eruption that he went about in fear and trembling lest he should inadvertently take a small dose of quinine or have it prescribed to him in some form by his physician. Dr. Stelwagon refers to eight or ten outbreaks; they may have been more numerous in the history of this unusually susceptible individual. The case brought before them was another instance of this susceptibility to quinine, and served to emphasise the serious character of the attack.

¹ *Journ. of Cutan. and Gen.-Urin. Dis.*, 1902, xx., p. 13.

DISCUSSION.

DR. DORE drew attention to the fact that in all probability some of the acute scarlatiniform eruptions described during attacks of influenza and from unknown causes might very well be the result of the administration of quinine in the case of individuals with this peculiar idiosyncrasy.

Mr. WILMOTT EVANS said that at the Dermatological Society of London he showed a case of recurrent bullous eruption. The patient took quinine for a time and then burst out into an eruption. She was now well.

The PRESIDENT said the etiology of the condition was an interesting matter. Very often in such cases there was no history forthcoming. In some cases there were obviously toxic intestinal conditions. In all the cases the patients seemed to become increasingly susceptible to the drug.

Case of Bromide Eruption.

By E. G. GRAHAM LITTLE, M.D.

THE patient was a female infant, breast-fed, aged nine months, who had been under the care of Dr. Edgecumbe Burrows, of Manor Park, Essex; no bromide had been given by this gentleman to the infant, who had had a little bronchitis, and had, according to the mother, been taking a mixture containing paregoric and squills. But the mother was a chronic epileptic, and since September, 1905, had, of her own accord, been taking thrice daily a mixture composed as follows:—

R	Pot. brom.	...	...	...	℥iss.
	Sp. amm. arom.	...	...	...	℥iv.
	Aquæ ad	...	...	...	℥xvj.
℥ss. <i>ter die.</i>					

The eruption had appeared in the child three months ago, apparently on the scalp first. When shown the following was the distribution and character of the rash:—

Right Leg.—The eruption was most severe and extensive here, the skin of the leg being almost obscured by the eruption, which consisted of very large frambœsioid tumours, surrounded by a red areola; thus there was a patch 2½ in. by 2 in., with a pearly nodular aspect and raised ¼ in. from the general level of the skin, on the outer surface of the leg; another slightly smaller patch, but similar, on the knee; another large fungating patch over the calf, another on the ankle,

another on the middle of the front of the leg, and several smaller patches dotted between these. On the right thigh there were two or three smaller patches and some nodules in an early stage, which showed the characteristic appearance of bromide eruption, the nodules being dotted over with minute, deep-seated follicular pustules. A section from one of these early nodules was obtained, and would be shown at a subsequent meeting of the Section.

Left Leg.—There was a single lesion, the size of a two-shilling piece, over the tendo Achillis, raised, and consisting of pearly nodules fused together into a plaque; there was a large, fungating, cauliflower-like patch on the left thigh near the vulva, and several smaller patches and nodules on the buttock.

Left Arm.—The sites of vaccination were covered by raised nodular patches, and there were similar patches on the left shoulder, front of neck, the summit of the right shoulder, the back of the neck, and the occipital region of the scalp. The face was entirely free.

The mother had never had any similar eruption. The child had not had any illness with the exception of the slight bronchitis mentioned, and was apparently otherwise well. She had been breast-fed since birth.

The exhibitor had seen only two other cases of equal severity: one shown by him at the Dermatological Society of Great Britain and Ireland in 1900, and another which had come to St. Mary's Hospital a year ago. In both these cases quite small doses of bromide had been given directly to the patients, who were in each case infants, and for quite short periods; in the latter case mentioned the dose had been $2\frac{1}{2}$ gr. a day, given for one week previous to the development of the eruption. The exhibitor had never seen anything approximating to this tumour formation in adults taking large doses of bromides. Yet, in an interesting paper contributed to the *British Medical Journal* (March 14, 1908) by Dr. A. J. McCallum, that physician's extensive and special experience had convinced him that adults were proportionately much less tolerant than children to the drug, and notwithstanding the large doses habitually employed by him—as much as 320 gr. per diem being given to a boy—"bromide rashes had never given him any trouble." It would almost seem as if small doses were more likely to produce eruption than large doses, and much the same conclusion had been adopted by many clinicians in the consideration of the frequency of eruption following the administration of iodides.

DISCUSSION.

Dr. SAVILL said that some years ago he went into the question of the frequency of the eruption in the cases treated at the West End Hospital for Nervous Diseases, where there was a large number of patients always taking bromide. He was able to collect only about eight cases of the frambœsial variety in ten years. Sometimes the eruption came on in patients who were taking quite small doses. One of the subjects of it never took more than 10 gr. three times a day. Nearly all the subjects of the condition were young people aged under 18.

The PRESIDENT said he agreed with what Dr. Savill had said, but nearly all adults who suffered from bromidism had some affection of heart or kidneys, unless, of course, they were taking gigantic doses. He was once asked to see a case at a fever hospital. It had been sent in as a case of small-pox. The medical men there knew it was not small-pox, but could not say what it was. He recognised it as a bromide eruption, and said that it would probably be found that she had cardiac disease, and it proved to be so. She was taking only small doses of the drug. There was in his "Atlas" a case pictured in which the patient only had 5 gr. three times a day for a few days, but she had marked albuminuria. The lesions were aggregations of minute pustules. If pricked very little fluid exuded; they were almost solid.

Dr. WHITFIELD quoted a case under his observation in which the bromide eruption had appeared in an infant three days after birth, the mother having taken the drug during pregnancy. He could thus confirm the experience noted in the present case, where the child apparently derived the eruption entirely from the mother's milk.

Case illustrating the effect of X-rays on Mycosis fungoides.

By H. RADCLIFFE CROCKER, M.D.

THE patient was a woman, aged 31, and had a distinct specific history. Eight months after the parturition an eruption appeared, which looked like confluent small-pox, the whole skin being covered with pustules, except the hands and feet. This was probably due to the fact that she had been taking iodide of potassium two months, and an improvement occurred soon after stopping the drug; then pustules recurred on the parts previously attacked and she developed some eczema. In June last year she had an universal eczematous dermatitis, dry and scaly, very much as seen at the meeting. The tumours began in November, 1906, the first round the umbilicus on the right side. A few other cases of the kind had a history of syphilis, but the bulk of them had not. She

exhibited a point which Mr. Pernet brought out, that there was great longevity in the parents. He had traced such a history in many cases, but he did not know what its significance was. There was a rather acute dermatitis on the feet, and it was questioned whether that was due to X-rays, but a little further treatment by those rays cleared it off. Eczema yielded to X-rays if they were not applied too strong. Some time ago there was shown a clergyman, the subject of mycosis fungoides, with a large number of tumours, and they were entirely removed by means of X-rays. Some recurred, the treatment was resumed, and the last news of him was that he had married, so that presumably he was fairly clear of the disease. He did not know of a case of permanent cure.

**Case of Lupus, with Unusual Features, suggesting
Lupus pernio.**

By J. H. SEQUEIRA, M.D.

THE patient, a married woman, aged 41, lives in Wales. She has two healthy children, aged respectively 9 and 2½. There is no history or evidence of tuberculosis in the patient or her family. One of her brothers has rheumatism.

She enjoyed good health until nine years ago, when, after an attack of influenza, she noticed that there was a difficulty in breathing through one nostril. She was treated without benefit. In the next year (1900) the left nostril had become "blocked," and a swelling appeared about the left wrist. In March of that year an operation was performed upon the nose and some "thickened bone" removed. The patient states that this operation gave her no relief, and it was followed by the spread of the trouble to the other nostril. A month after a red spot appeared at the tip of the nose, close to the site of the operation. The red area steadily increased until the whole of the nose and part of the cheeks and upper lip became affected. At the same time the swelling of the wrist spread to the hand on both sides and ultimately to the fingers.

During the summers of 1906 and 1907 the patient states that she suffered a great deal with swellings of the feet, which disappeared. There is still, however, some swelling of both great toes.

In 1904 she had a rather severe attack of "erysipelas" in the face, and in 1907 there were five attacks of similar character. There had been no erysipelas-like outbreaks on the hands.

The patient shows no signs of visceral disease. The urine on the occasions on which it has been examined proved to be free from albumin. She is a nervous woman, highly excitable, but has fits of great depression, probably induced by the chronicity of her disease and the disfigurement it causes. She is thin, but wiry and active. The nose is swollen and red, and the red areas extend out on to the cheeks and on to the upper lip. The skin of the nose is thickened, and when first seen was covered with large dilated vessels. The left ala nasi is partially destroyed and the orifice is contracted. This is the site of the operation. I have not been able to make out any actual lupoid nodules in the tissue affected, but Sir Malcolm Morris, who saw her before I did, kindly referred to his notes and tells me that he found some distinct nodules. The affected areas on the cheeks are red, raised, and also show dilated vessels. The upper lip is in the same condition, the redness extending down to the margin of the mucous membrane.

The ears are free from disease. Mr. Hunter Tod has examined the interior of the nose. He remarks on the thickening of the mucosa, but could find no evidence of lupus vulgaris. The buccal mucosa and larynx are also free from disease.

The remarkable feature of the case is the condition of the hands. Both are enormously swollen, the left a little more than the right. The swelling begins at the wrist and involves both the palmar and dorsal aspects. The skin is purplish in colour, thickened and tough, but there is no pitting on pressure. There is swelling also of the digits, which is more marked at the proximal part and produces a curious tapering appearance. The character of the skin is the same as on the hands. The nails are unaffected. Both great toes present a somewhat similar appearance, but less severe. There is no swelling of the feet. From the hypertrophy of the hands it would appear that not only the skin but the subcutaneous tissue is affected.

The circulation at the periphery is obviously bad, but it is remarkable that the patient describes the trouble as being more acute in the summer.

The facial condition has much improved under treatment. The Finsen light has been applied and gave excellent reactions, which have been followed by a diminution of the colour and swelling. The large dilated vessels have been treated by electrolysis with advantage.

General tonic treatment has also been adopted, and the patient has been taking cod-liver oil and a mixture containing iron and arsenic. No alteration in the condition of the hands has been observed.

DISCUSSION.

Dr. GALLOWAY said he brought to the Dermatological Society of London a somewhat similar case, but affecting the lower extremities. The outstanding feature was the constantly recurring attacks of erythema with solid œdema, passing off from a condition almost resembling elephantiasis. The case was associated with Graves' disease, though that association was probably accidental; still, it should be borne in mind as possibly associated with the lymphadenoma. Three weeks ago he had a case affecting the left arm, sent up from Woolwich to the hospital, in which a most careful examination failed to reveal any cause for the lymphatic obstruction, X-rays also being used. Yet there seemed to be elephantiasis of the whole left arm. He believed it to be an infective process, but nothing septic could be detected in the case.

The PRESIDENT said it would be agreed that elephantiasis was a mere symptom of blocking, the question being, What caused the blocking? In the past history of the present case there was recurrent lymphangitis, and possibly there was now a faint degree of it in the hands. He thought there must be some infective process.

Dr. WHITFIELD thought the fact that it was present in the two hands was against the idea of septic lymphatic blocking, as also was the slow growth of the condition. He thought they were somewhat allied to Raynaud's disease--so-called recurrent erysipelas of the face; and the lupus pernio which Dr. Colcott Fox mentioned was much more likely to be associated with Raynaud's disease.

Dr. SAVILL suggested that the condition was allied to erythromelalgia, which Weir-Mitchell described. The condition was transitory at first, but became established later. About five years ago he published in the *Lancet* a case of the kind in which some toxic state was present.

**Case of Chronic X-ray Dermatitis of the Hands; removal
of Warts by measured doses of the X-rays.**

By J. H. SEQUEIRA, M.D.

THE patient, an operator in the X-ray department of the London Hospital for the past eight and a half years, has suffered from dermatitis of the hands for six years. During the first four years he assisted in the radiographic work and used the screen in a large number of cases. He also developed radiographs. For the past four years he has been employed only in X-ray treatment. The X-ray dermatitis has shown the usual exacerbations in the winter months. The nails have suffered severely, and the patient is now on leave recovering from an operation on one of them. The backs of the hands and fingers presented numerous telangiectases and atrophy of the skin, and both had been studded with

numerous dark, dry warts, the left hand being worse than the right. The palmar aspect was unaffected, but on the left there has recently appeared a black spot, not raised, and like a pigmented mole in appearance. Several small black points have appeared on the left upper arm.

The patient is shown for two reasons, the first being that the back of the left hand has been cleared of the warts by means of the X-rays. It is important to realise that the diseased condition is due to long-continued irritation of the skin by short, frequent exposures to the X-rays, such as occur in screen work and in the old, and as has been amply demonstrated, most dangerous habit of testing the penetration of the tube by the hand and screen. This kind of irritation is entirely different from the action of the X-rays given therapeutically by measured doses. I have seen great improvement in the condition of the face of a patient suffering from xeroderma pigmentosa, the warty growths being removed by the X-rays; and recognising that the chronic form of X-ray dermatitis is in many respects similar to Kaposi's disease, it is natural to expect a favourable result in the radio-dermatitis. The warty areas were exposed once only to X-rays until the B tint was obtained on the Sabouraud pastille. This dose is equivalent to about five Holtzknecht units. A definite, but slight, reaction was noticed at the end of twelve to fourteen days, and the areas are now, five weeks later, quite smooth. They still, of course, show telangiectases and atrophy, with a little pigmentation. The left hand, the worst, has been treated, and I am showing the patient at this early date to demonstrate the contrast between the treated and untreated hands. It is intended at once to treat the right hand. The case is not reported as one of cure of X-ray warts, for the time is far too short to be certain whether the improvement is more than transient. The fact, however, that the warts may at any time become epitheliomatous renders it of the greatest importance to remove them if this can be done without risk.

The second point of interest in the case is the presence of the pigmented spot, 1 cm. in diameter, on the palmar surface of the left hand. In X-ray workers it is the dorsal aspect of the hands and fingers which suffers, so that it is quite possible that the pigment spot may have developed independently. The fact also that several small pigment spots have appeared on the upper part of the arm, which is always covered and protected from the rays, and where there has never been any dermatitis, favours that view. So far no record has been made of the appearance of such spots in X-ray workers, but there is still so much to be learnt about the remote effect of the rays that I deem it

sufficiently important to call attention to the matter. In the interests of the patient I suggest removal of the pigmented spot on the palm.

DISCUSSION.

Sir MALCOLM MORRIS said the dermatitis did not necessarily go as a result of the application of the rays. He had a case in which the warts had gone, but the X-ray dermatitis was still going on. It seemed somewhat risky to treat the dermatitis by the agency which was responsible for the original trouble, and the time was too short to say that it was a case of cause and effect.

The PRESIDENT said there was a striking difference between the area which had been treated by the rays and that which was not. He thought the pigmented spots should be treated.

Dr. WHITFIELD said that he was told by Mr. Reid, the radiographer at King's College Hospital, that no one got X-ray warts on the hands who did not develop photographic plates. The present patient had stopped developing plates five years ago, but he appeared to have had the warts six years.

Dr. J. M. H. MACLEOD, in a communication submitted subsequently, considered that the X-rays themselves were capable of producing the warty growths seen in the patient's hands, and that they were not entirely due to the action of the chemical reagents he had been employing in developing X-ray photographs. It had been asserted that the warty growths were not caused by the X-rays and only occurred in X-ray photographers, but in opposition to this view he cited a case of extensive X-ray dermatitis with warty growths in a man who made X-ray tubes, and whose hands were frequently exposed to the rays, but who was not in the habit of exposing them to chemical irritants. He considered that the warty growths were as much a feature of chronic X-ray dermatitis as the somewhat similar lesions were a characteristic of xeroderma pigmentosum. With regard to the melanotic lesions on the left palm and arm, he had never seen such occur before, but thought it possible that they might be connected with the X-ray dermatitis, and in view of the possibility of their being sarcomatous considered that they should be destroyed.

Dr. PRINGLE said the first case of the kind was shown by him at the Dermatological Society of London, and the patient was a photographer. The idea that the condition of his nails was due to X-rays was not generally accepted, but was attributed to the photography.

Mr. KETTLE (introduced by Dr. Graham Little) showed :—

(1) Sections of a hard Hunterian chancre, stained by Levaditi's method for *Spirochæta pallida*, and showing that organism with unusual clearness and in great abundance.

(2) Film preparation, made from the unruptured vesicle of a bullous congenital syphilide, and stained with Giemsa's stain. The spirochætæ in the latter preparation were quite distinctly shown, but less perfectly than in the former case.

Dermatological Section.

May 21, 1908.

Dr. RADCLIFFE CROCKER, President of the Section, in the Chair.

Case of Nodular "Ringed Eruption."

By H. G. ADAMSON, M.D.

THE patient was a printer, aged 17. Five months ago "small red lumps" appeared upon the backs of the fingers and gradually increased in size. When he first came under observation one month ago there were present on the dorsal surfaces of the fingers of both hands raised, firm, dusky red, nodulated, disc-like areas of from $\frac{1}{2}$ in. to 1 in. in diameter, and elevated about $\frac{1}{8}$ in. to $\frac{3}{16}$ in. All the fingers of each hand were involved; in some the dorsal aspect of one phalange, in others of two phalanges, and in the case of the first finger of the left hand the lesion extended over the middle joint. On close inspection, and particularly on palpation of the raised, disc-like areas, it was evident that they were made up of closely set pea-sized nodules, but it was only on careful examination that this feature could be made out, for the individual nodules were close together and their margins were ill defined. In some of the patches there was a tendency to ring formation owing to the arrangement of the nodules towards the margin of the patch. The hands were cold and of a dusky hue. There were, in addition, a few isolated, pea-sized, dusky red nodules on the backs of the hands. One of these was excised, and within a fortnight the whole of the lesions had almost disappeared. It was curious that a similarly rapid disappearance of the lesions had occurred in a case of "ringed eruption" recorded by Dr. Graham Little after a biopsy. [A photograph of one hand, taken when the lesions were still present, was shown.] The exhibitor regarded the case as belonging to the group of cases variously described as "ringed eruption" (Colcott Fox), granuloma annulare (Crocker), lichen annularis (Galloway).

A section of one of the lesions from the back of the hand showed some widening of the prickle-cell layer and of the horny layer of the epidermis (possibly due to the fact that the section had been cut obliquely). In the corium the fibrous connective tissue was normal, but in it there were numerous circumscribed collections of mononuclear round-cells around the blood-vessels and a large mass of the same type of cells around the sweat gland. There were no young connective tissue cells, epithelioid cells, plasma cells, nor polynuclear leucocytes. The absence of young connective tissue cells described in other cases was probably due to the fact that the lesion excised was at a very early stage. The clinical features and the histological findings suggested a toxic rather than a microbic origin.

DISCUSSION.

The PRESIDENT (Dr. Radcliffe Crocker) said that the condition did not suggest granuloma annulare to him.

Dr. COLCOTT FOX said he was not prepared to give a name to the condition. When Dr. Adamson first showed the case to him it was very striking on the fingers, but that had now gone. He regarded it as chronic, but not an ordinary erythematous eruption.

Case for Diagnosis.

By H. G. ADAMSON, M.D.

THE patient was a young woman; she was very anæmic; she had suffered from an eruption on the back of the right hand for two years. The lesions consisted of three herpetiform groups of split pea-sized superficial erosions running together to form polycyclical areas (recalling the erosions of preputial herpes). When first seen one week ago these erosions had been actual vesicles, hemp seed-sized to split pea-sized, thick walled, evidently of recent origin, although situated on an infiltrated, pigmented base obviously of longer standing. It has since been found that the patient (who is a bottle-washer) uses nitric acid in her work, and that the lesions date from the time of an application of strong nitric acid for the cure of a tattoo mark on her arm. The evidence therefore seemed in favour of the eruption being artificially produced (*i.e.*, *feigned eruption*), although the herpetiform character of the lesions was unusual.

The PRESIDENT said the condition suggested some microbic origin, but he was not prepared to state the particular microbe. He had never seen an exact parallel.

Case of Leprosy.

By T. J. P. HARTIGAN, F.R.C.S.

THE case was shown to a post-graduate class, and two out of three correctly diagnosed it. He showed photographs taken in 1905 and 1907. No lesion was visible by anterior rhinoscopy, but smear preparations were found to contain the bacilli, and they were present in nodules expressed from the face lesions. It was the first case which had been treated with nastin, and though only two injections had been given so far, several lesions were much reduced in size and much drier. The patient said that on the day after he had the first injection he felt better than during the preceding five years, feeling stronger and enjoying his food more. He had treated leprosy with Chaulmoogra oil, but did not think it did very much good. It was necessary to use the nastin with care, especially when the eye was involved, as there might otherwise be clouding of the media. He had begun by injecting only the smallest dose. The preparation was made from a culture of streptothrix given from a leprous nodule. A portion of the leprous nodule was grown in sterilized water, then incubated for some time. After a few weeks a fungus grew, which, though not the same as the leprosy bacillus, had certain resemblances to it. That was afterwards extracted and mixed with benzoyl chloride. The mixture was then standardized and injected into the patient, and it produced a reaction analogous to that caused by tuberculin in tuberculosis.

Dr. PARKES WEBER thought it was *Botryomycosis hominis*, which was practically a vascular structure. In the stroma there were plasma cells and leucocytes.

Case of (?) Dermatitis artefacta.

By E. G. GRAHAM LITTLE, M.D.

THE patient (sent to Dr. Little by Dr. Date, of Culmstock) was a lady, aged 36, who had suffered from ulcers on the legs, thigh, and arms. The first of these had appeared, when aged 16, on the left leg, where there was a large scar; four years ago one had come upon the left arm;

this had been scraped and had healed completely. The present crop had made its appearance last autumn, and at the present time there were six large but rather superficial ulcers, of an average size of 3 in. by 2 in., on the upper and outer part of the right thigh; they were quite close to each other and of a curiously regular outline and symmetrical shape. Upon the back of the right leg there was a much larger patch of superficial ulceration occupying nearly the half of the leg. It was notable that these and all the lesions of previous ulcerations were in positions within easy reach of the hands.

The patient had been variously treated during the illness. She had, according to Dr. Date's careful and excellent notes, been scraped; she had been put under X-ray treatment (which made things worse); she had had potassium iodide in 15 gr. doses three times daily for eight weeks without good effect; she had been in a home at the seaside for months, and had "taken any amount" of malt and cod-liver oil. A portion of skin from the edge of one of the ulcers had been examined by Dr. Bulloch, of the London Hospital, who had reported that he found no tubercle bacilli in the section, but the condition of some of the arteries had suggested the possibility of syphilis. There was no tubercular history in the family, and the patient herself was a plump, eminently healthy-looking person.

When first seen the ulcers were covered with a very foetid discharge. The patient had been carried into the consulting room on a stretcher, and the apparent lack of necessity for so much disablement had suggested to the exhibitor a hysterical causation. On examination with this idea it was found that there was a contraction of the right knee, probably hysterical (which had, in fact, rapidly improved while under treatment during one week), and some lack of sensation of the right as compared with the left side. The palate was comparatively insensitive also. The knee-jerks, especially on the right side, were greatly exaggerated, and there was almost clonus of the right ankle.

The syphilitic treatment had been continued after a Calmette test (1 per cent.) had proved negative. Iodism had shown itself within a few days, so mercury only was administered. The ulcers were dressed with occlusive dressings impregnated with hydrogen peroxide, and had shown immense improvement in a few days. Within a fortnight of her admission into a home most of the ulcerated patches had skinned over. This fact, coupled with the hysterical features, had inclined the exhibitor to the opinion that the case was one of "dermatitis artefacta," though no definite evidence of the method of production was obtainable.

DISCUSSION.

Dr. GALLOWAY said some members would remember a case which was brought from Amsterdam to the Congress in London in 1896, and he would regard the present case as of the same class, namely, chronic granuloma. Only on the previous day he had a post-mortem on a case which had been admitted into hospital with the tentative diagnosis of endocarditis. It was thought to be tuberculous, and Calmette's reaction twice produced a positive result. The post-mortem showed that the patient had rapidly advancing endocarditis affecting the left side of the heart, but there was no trace of tubercle anywhere in the body.

The PRESIDENT said it was not obvious to him that the condition was artificially produced, though he could not suggest an alternative diagnosis. Artificial lesions of that character were very rare.

Mr. PERNET favoured the artificial theory, which he considered was supported by the shape of the lesions.

Dr. WHITFIELD thought the lesions showed what looked like apple-jelly nodules. When the blood was expressed there was left a transparent appearance, and he believed the condition to be tuberculous.

Case of Varus nodulosus of Brooke.

By E. G. GRAHAM LITTLE, M.D.

THE patient, a man aged 40, was kindly sent for exhibition by Dr. Purdie, of Kentish Town. The eruption was plentiful upon the face, and the case recalled very faithfully the appearances depicted in the plate with the title "varus nodulosus" in the "Iconographia Dermatologica" of Jacobi. It consisted of small shiny nodules deeply situated in the skin; some of these seemed to be vesicular, but on being pricked no fluid escaped. There was little inflammation round the nodules, which were closely grouped and most thickly distributed on the forehead, just below the lower eyelid, on the cheeks, the chin, and upper lip. The skin of the face was generally seborrhoeic. The condition had persisted for eight months. There was a mottling of the skin, with one or two ill-defined nodules on the forearms. The patient was a grocer, and the aspect of the forearms was perhaps explicable by his occupation. There was no tubercular history. The man had suffered from chronic diarrhoea, but was otherwise well.

DISCUSSION.

The PRESIDENT said he was of opinion that the condition was one of *acne agminata*, and that it was due to intestinal toxins. The patient admitted he

had chronic diarrhoea. In some cases there was constipation. Tilbury Fox first described such cases, and they were successfully treated on the intestinal toxin theory. The lesions were always of slow growth and showed a fungous structure. There was a deep-seated folliculitis.

Dr. COLCOTT FOX said he had always considered the case described by Brooke as "*varus nodulosus*" as a tuberculide, and would accept this case as of the same type.

Dr. PRINGLE did not think this case as of the same nature as his case of "a rare seborrheide" included by Brooke in his class of "*varus nodulosus*."

Dr. GRAHAM LITTLE promised to obtain a section of the skin and to report later on its nature.

Case of Folliculitis decalvans (Pseudo-pelade of Brocq).

By E. G. GRAHAM LITTLE, M.D.

THE patient was a young woman, aged 26. There were lines and streaks of cicatricial atrophy, dating from only six months ago, and without any history of previous inflammation. She had suffered from headache, chiefly frontal, and the scalp was seborrheic. The hair adjoining the cicatricial patches was altered in appearance, the follicles being slightly reddened and swollen.

DISCUSSION.

Sir MALCOLM MORRIS asked why it should be called the pseudo-pelade of Brocq. Such cases were shown at the Dermatological Society of London long before Brocq wrote his paper on it.

The PRESIDENT said he agreed with Sir Malcolm Morris's remark. He believed alopecia cicatrizata was a better and more descriptive term.

Case of Pseudo-xanthoma elasticum of Balzer.

By E. G. GRAHAM LITTLE, M.D.

THE patient was a woman, aged 56. The eruption consisted of mesh-like patches of buff-coloured infiltration, lumpy in some places, in others linear and hardly at all raised from the surface; the whole of the neck was occupied by the eruption, but it was especially marked at the sides. The face was entirely free. Small patches of the same type were present in the flexures of the elbow. The condition had persisted for more than twenty years and there were no symptoms in connection with it. The patient had never had jaundice or liver troubles.

The exhibitor had had two cases of much more limited distribution of pseudo-xanthoma elasticum, in which a biopsy had corroborated the diagnosis; this had not been obtainable in the present instance, but the clinical similarity of the case now shown with these two made this diagnosis more than probable. In Brocq's recent treatise the statement was made that only four cases had hitherto been recorded: one by Balzer, one by Chaffard and Darier, one by Bodin, and one by Weither. This remained, therefore, one of the rarest of skin diseases; but probably the difficulty of diagnosis without a biopsy, and the impossibility of obtaining this in many instances, added to the obscurity of the disease and the rarity of its identification.

Case of Unusually Generalized Nævus verrucosus zoniformis.

By E. G. GRAHAM LITTLE, M.D.

THIS case in some of its features had suggested the diagnosis of keratosis follicularis of Darier, but the diagnosis now substituted was undoubtedly the correct one. The alternative name for this condition mentioned by Brocq (*nævi keratodermique hyperkératoses urigénitales circonscrites*) would, perhaps, fit this particular case better than the one adopted; but the case resembled very closely that pictured under the title of *nævus verrucosus zoniformis* in Brocq's treatise.¹

The patient was a Jewish infant, now aged 18 months. The skin was quite free from blemish at birth, with the exception of a small patch of flat warty *nævi* on the dorsum of the left foot. At 3 months of age other parts of the body had become invaded, and during the later fifteen months of his life more and more of the body was affected. At the present time the distribution was as follows: The most prominent lesions were in both the axillæ and the neck (*vide* Brocq's plate, mentioned above). Here there were continuous patches of flat and acuminate elevations with a follicular distribution. The axilla of the left side was more affected than the right, and the patches extended downwards on to the side of the chest. Less prominently raised but similar patches were present on the middle of the left flank and on the left groin, on the back and side of the left upper arm, on the front of the left wrist and the back of the left hand. On the left buttock there was a patch which ended in a linear streak running down the middle of

¹ "Dermatologie Pratique," 1907, ii., p. 588.

the back of the thigh and leg to the foot; an exactly similar patch and streak were present on the right buttock, thigh, leg and foot. On the left foot, where the earliest example of the disease was recorded, there was a continuous patch over the dorsum of the foot and over both malleoli. There was a smaller but similar patch on the left foot. There were isolated, grouped, small, flat, warty elevations scattered over the right flank and side of the chest. In the mid-line of the neck, from the chin to the sternum, there was a linear warty streak. The face was quite free.

The curiously follicular arrangement and the symmetry made it difficult to be certain that some degree of keratosis follicularis was not present, and certainly constituted it an anomalous case of *nævus verrucosus*, which was much more commonly unilateral.

Case of Lupus erythematosus affecting the Hands, Ears, and Scalp.

By J. M. H. MACLEOD, M.D.

THE patient was a delicate-looking woman aged 45, who worked as a dressmaker. The disease began six months ago on the hands. Since childhood she had suffered from a weak peripheral circulation, with cold extremities and chilblains. Gradually the chilblains on her hands had given place to permanent red patches associated with atrophy and indistinguishable from lupus erythematosus. When she was seen at Charing Cross Hospital in April, 1908, the following lesions were noted: Both hands presented a mottled, cyanosed appearance and felt cold and moist. On the backs of several of the fingers were violaceous patches, roundish in shape, the larger being about the size of a sixpence. The centre of two of the patches was paler, somewhat atrophic, and covered by an adherent scab, which gave the lesions a ringed appearance. The nail of the middle finger of the left hand was discoloured, thickened, and broken at the free margin, while several of the other nails were ridged, opaque, and brittle. Atrophic scaly patches were present on both ears, especially about the lobules. Behind and above the right ear, on the scalp, there was an irregular atrophic patch about the size of a five-shilling piece, with cribriform pits and a few telangiectases on its surface. There was a family history of tuberculosis, one sister having a tuberculous ankle, but there was no evidence of this disease in the patient.

Coloured drawings of two other cases were also exhibited, showing chilblains on the hands which had become persistent and assumed the characteristics of lupus erythematosus. The chief interest of the case, which was borne out by the drawings, was the close relationship of the chilblains to the lupus erythematosus.

Case of Alopecia areata following Small-spored Ringworm of the Scalp.

By J. M. H. MACLEOD, M.D.

THE patient, a girl aged 8, came under the observation of the exhibitor six weeks ago, when it was noted that the ringworm was widely disseminated over the scalp. In addition to the ringworm several finger-nail-sized bald patches were observed. An ointment of salicylic acid and sulphur was prescribed, to be rubbed in twice daily. She has been seen several times during the six weeks she has been under this treatment, and on each occasion the alopecia has been more marked. At the time of exhibition irregular bald patches were distributed over the scalp. The incidence of these was not associated with any definite inflammation. At the edges of the patches there were a few atrophic hairs. The bald patches did not seem to occupy the precise areas which had been affected by the ringworm, but extended beyond these areas. Cases of this nature have been explained as the result of the employment of some irritating ointment. This may be true in some of them, but not in all, for in this case the alopecia was noted in association with the ringworm before the active treatment was commenced. Possibly in some of the cases it is simply a coincidence, while in others the function of the papillæ may be interfered with by the presence of the fungus in and about the hairs.

Case of Spreading Telangiectases of the Feet and Legs.

By SIR MALCOLM MORRIS, K.C.V.O., F.R.C.S.Ed., and
S. E. DORE, M.D.

THE patient, a man aged 32, noticed red patches on the outer side of his feet when he returned from a year's military service in South Africa in December, 1900. They were attributed to the wearing of

tight putties for prolonged periods and to the intense cold. The peculiar feature of the case was that although the patches remained stationary on the feet and ankles they continued to spread up the legs to the knees, and recently the calves of the legs had become involved. The patches resembled an ordinary port-wine mark, consisting of dilated vessels arranged in a close network or in parallel lines. They were almost exactly symmetrical, leaving areas of unaffected skin on the dorsal surfaces of the feet and toes. On the feet and ankles they were of a blue tint with well-defined straight borders; on the legs the colour was bright red or crimson, and the telangiectases were not so closely aggregated. There was also slight erythema and some desquamation of the skin of the legs. The patient had always suffered from coldness of the extremities, which was aggravated in South Africa, but he had never had chilblains. His health was good, and, with the exception of the weakness of the peripheral circulation referred to, a careful examination revealed nothing abnormal in his cardio-vascular or other system. There was no history of hæmorrhages or hæmophilia either in himself or his family.

Sir MALCOLM MORRIS had asked himself why the lesion went on spreading after the condition which produced it was withdrawn for so long. He did not regard it as a case of Hutchinson's infective angioma, and no part showed an erythematous character. There had been no erythema multiforme, and there was nothing on any other part of the body. The urine contained cloudy phosphates, but there was nothing abnormal found in the viscera, and there was no history of hæmophilia. Neither was there any nævus, nor birth-mark, nor were there any arterial changes.

Case of Morphœa.

By J. H. SEQUEIRA, M.D.

THE patient, a lad aged 19, had been seen previously at a meeting of the Dermatological Society of London.¹ He is employed at a railway works, and five years ago was injured by a fall. He had some extensive bruising on the lower part of the left side of the chest, but apparently no bones were broken. His general health has been excellent.

In January, 1907, he first noticed a change in the condition of the skin of the left thigh and leg and trunk. When he was first shown

¹ *Brit. Journ. Derm.*, 1907, xix., p. 242.

he had a long patch of morphœa about $1\frac{1}{2}$ in. wide, beginning a hand's breadth below the anterior superior spine of the ilium on the left side, and running obliquely across the upper part of the thigh to the inner side. Thence it followed the sartorius muscle to the inner side of the knee, and below the knee widened out to include the front and inner sides of the leg. It terminated below by a line crossing the foot at the level of the mid-tarsal joint. The area was tough, hard, dark at the margins and pale in the centre. It had the characteristic unpinchable quality, and in some parts resembled old ivory in colour. At that time there was an extensive area of ulceration on the front of the leg due to trauma.

There was also an area on the anterior and lateral parts of the chest and upper abdomen. This extended exactly to the middle line of the trunk in front. Posteriorly it ended along a line behind the level of the anterior border of the axilla. This area was darker than the rest of the skin of the trunk, and scattered over it there were a large number of small atrophic spots of white colour. These spots measured from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. in diameter. There were also three or four larger dark sclerosed areas. It was noted at the time that there were marked atrophic as well as sclerotic changes.

During the last three months the diseased area has increased and fresh areas have appeared. The dark area with atrophic spots on the left side of the trunk now extends from just below the ribs to near Poupart's ligament. There is no spot on the back. A new area has appeared on the right side of the trunk. It is about as large as the palm of the hand, and its upper border is on a level with the umbilicus. This shows atrophic spots only. On the thigh a new area of pigmentation with atrophic spots has appeared between the upper margin of the long band of morphœa and Poupart's ligament. The thigh and leg are in much the same condition as when he was seen before, and there is again an area of ulceration due to slight injury. It is noteworthy that the patient has been under observation the whole of the time, and the new spots have appeared without any previous sclerosis, that is to say, the spots have been, so far as could be judged by regular inspection at least once a month, atrophic from the beginning.

Case of Granulomatous Swellings at Left Angle of Mouth and in Right Inguinal Region.

By J. H. SEQUEIRA, M.D.

THE patient, a negro from Antigua, was shown in February with a large granulomatous tumour at the left angle of the mouth and a linear patch of granuloma in the right inguinal region (*granuloma inguinale tropicum*).¹

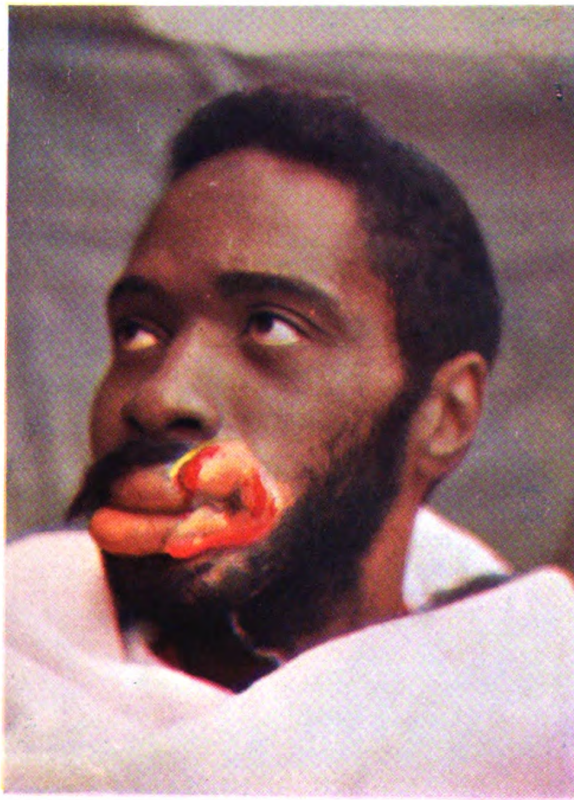
The tumour at the angle of the mouth and the granulomatous swelling in the groin have entirely disappeared under the X-rays. In the course of eight weeks seven pastille doses (measured by the pastille of Sabouraud and Noiré) have been administered. This is equivalent to about thirty-five Holtzknecht units given in the eight weeks. The exhibitor mentioned that previously to giving the X-ray treatment the patient had been taking large doses of iodide of potassium without any benefit. While the X-rays were being given no other treatment was adopted beyond the application of protective dressings of zinc oxide and lanoline and vaseline spread on lint.

Case of Multiple Xanthoma of the Face of the Diabetic Type in an Infant.

By F. PARKES WEBER, M.D.

THE eruption is confined to the forehead and upper part of the face. It consists of irregularly distributed papules and raised spots, measuring 1 mm. to 7 mm. in diameter, and varying in colour from a brownish red to a dirty pale yellow. When the blood is squeezed out of the red spots a yellowish discoloration of the skin is left. The smaller papules, such as those on the left lower eyelid, are the most elevated and the most yellow (least reddish) in appearance. There is no itching or pain or tenderness associated with the eruption, which was first noticed about four months after the child's birth. There is no factitious urticaria. The patient, John H., now aged 10 months, seems well in all other respects, and has apparently never been ill. He has taken no medicines, such as bromides. Microscopic examination of one of the

¹ *Proc. Roy. Soc. Med.*, 1908, i., No. 5 (Derm. Sect.), p. 57.



Granulomatous Tumour at left angle of mouth.

SEQUEIRA : Case of Granulomatous Swellings.



spots showed merely an excess of connective tissue cells beneath the epidermis, but the lesion which was examined was probably an imperfectly developed one. At present the eruption seems to be practically non-progressive, and no fresh spots have appeared recently or, according to the mother, for a good time.

Dr. Weber added that the section under the microscope was from an early lesion, and did not show much beyond connective tissue cells. There had been no itching of the skin, nor anything of the kind before. He believed the lesions were now increasing in number.

The PRESIDENT said Dr. Weber's case did not follow the type of xanthoma; the lesions looked more like urticaria pigmentosa. Itching was not always present in urticaria pigmentosa.

Case of Disseminated Lupus with Chronic Lymphangitis of the Face and Osteo-arthritis of the Hands.

By A. WHITFIELD, M.D.

THE history of the patient, a woman aged 28, showed that before she was aged 7 she had had abscesses in the neck which had burst or been incised, and had healed, leaving tubercular nodules in the scars. Ten years ago she had been laid up with a violent attack of erysipelas, which had rendered her severely ill for nearly three months. Two years later she had another attack, which laid her up for three weeks, and since then she had had many slight attacks which did not lay her up.

On exhibition there were to be seen, on both sides of the neck, scars in which were scattered, flat, brownish lupus nodules with practically no hyperæmic redness around them. Several nodules were to be seen scattered about the cheeks in the otherwise sound skin. There were about half a dozen on the left cheek over and above the angle of the jaw, one or two on the right side, and one on the lobe of the right ear. The nose was distinctly swollen and red and the surface was scaly, while at the junction of the left ala nasi and lip there was a persistent fissure, from which, no doubt, the recurrent streptococcic infection took place. The upper lip was greatly swollen and thickened, but not reddened, and the mouth remained open with a curious pouting expression. The carpal, metacarpo-phalangeal and inter-phalangeal joints were swollen and contained a great deal of fluid, and there was marked atrophy of the interosseous muscles. When first seen the opsonic index to tubercle was

0.85, and that to staphylococcus 0.5. The streptococcus had not been isolated, though several attempts had been made to do so.

The patient was treated with staphylococcic vaccine and later with tuberculin, and a certain amount of improvement had taken place; but it was difficult to estimate it as the condition varied too much.

Dr. Whitfield said he thought that the condition of the joints was probably consequent on the repeated streptococcic infection.

DISCUSSION.

The PRESIDENT asked whether there was an attack of lymphangitis before the lupus condition. The erysipelas toxin might have been the means of setting the tubercle free.

Sir MALCOLM MORRIS said he had recently, from Egypt, a case of streptococcal infection of similar type, and it terminated in erythematous lupus as soon as the œdema began to go down. There seemed to be evidence of the original condition starting in the erythematous lupus.

Dr. WHITFIELD said, in reply, that he thought the President's suggestion was correct. The patient had mild attacks every week.

DR. WINKELRIED WILLIAMS showed a case of lupus erythematosus saccharo-mycetiform, governing lines of growth, and band alopecia.

The PRESIDENT said he did not regard lupus erythematosus as a tuberculide. It was probably toxic, the origin being the bowel. The case was an interesting type of the disease.

DR. RADCLIFFE CROCKER showed a drawing of a case for diagnosis. Dr. Crocker explained that the case was so far advanced towards cure that there was very little to show. He had never met with an exactly parallel case. The stained sections were not yet ready, and Dr. Bunch had succeeded in obtaining only staphylococci. If anything further was to be learned from staining Dr. Bunch would communicate it. The duration of the case was one year. He had cleared out the comedones and used local bactericides, and the patient seemed to be in a fair way to recovery.

Dermatological Section.

June 18, 1908.

Dr. RADCLIFFE CROCKER, President of the Section, in the Chair.

Granuloma annulare.

By E. G. GRAHAM LITTLE, M.D.

A CONSIDERABLE number of cases have been reported of a type of disease concerning which there is a great diversity of opinion and a corresponding diversity of nomenclature. The names under which these cases have been described—if they are all accepted as of the same type—are as follows: ringed eruption (Colcott Fox, 1895), eruption circinée chronique de la main (Dubreuilh, 1895), lichen annularis (Galloway, 1899), granuloma annulare (Radcliffe Crocker, 1902), sarcoid tumours (Rasch, 1903), néoplasie circinée et nodulaire (Brocq, 1904), erythémato-sclérose circinée du dos des mains (Audry, 1904), tumores benigni sarcoidei cutis (Galewski, 1908). I propose in the following paper to discuss the question of the relation of these cases one to another, and their common symptoms, for I personally now believe that all the cases are related.

I am naturally reluctant to differ in this point from the expressed opinions of Dr. Radcliffe Crocker and Dr. Galloway, who have maintained the differentiation of these two types of cases; Dr. Radcliffe Crocker, however, has recently confessed to his keeping an open mind as to the possible future identification of the disease which he called “granuloma annulare” with the disease called by Galloway “lichen annularis,” and it is obvious that all the other recorded cases fall into one or other of these two categories.

Correction.

In the last issue of the *Proceedings* (No. 8), Dermatological Section, p. 83, Dr. Parkes Weber's remarks applied to another case shown by Mr. Hartigan, and not to the case to which they are attached.

Note.—With regard to Dr. Sequeira's case, p. 92: As the illustration in this case is the first of its kind that has ever appeared, Dr. Sequeira thinks it desirable to state that the plate was made from photographs, *in three colours, taken direct from the patient*, by Dr. Arnold Moritz.

I have had, as I think, six instances of the disease under my own observation, and have seen several other of the cases described in the synopsis submitted in the appendix. I have also, by the kindness of individual friends (whose favour is in each instance acknowledged), had opportunities of examining sections of eleven cases other than my own, and of my own in four out of the six cases, so that in fifteen cases I have been able to compare the histological appearances. What I have to say, therefore, is founded very largely on my own observations, both clinical and histological, and I have, at any rate, convinced myself that it is possible to reconcile the differences indicated in the very diverse terminology adopted, and that it is worth while trying to do so.

Accepting the identity of the affections under the disguise of this plurality of names, six memoirs of importance have been published on this subject—those of Galloway (1899), Radcliffe Crocker (1902), Rasch (1903), Audry (1904), Brocq (1907), and Galewski (1908). Brocq closes his description of the disease with these words: “Il est donc impossible de dire à l’heure actuelle s’il s’agit là d’une affection bien définie, ou de plusieurs dermatoses ayant un aspect à peu près identique; c’est une question à reprendre de fond en comble.” In order to enable the reader to make as complete a survey as possible of this field of disease I propose to offer a short abstract of all the cases hitherto published, and to add detailed descriptions of those cases as yet unpublished which have been communicated to me by the kindness of friends, and of those cases which have come under my own observation; these latter I shall reserve to the end of my paper. It will be noted that I have excluded from my list a series of cases recorded by Jonathan Hutchinson, sen., which are included in Dr. Galloway’s collected examples of the disease, published in 1899. No histological investigation of these cases was made, however; the notes are scanty, and the clinical facts observed do not, to my mind, justify their inclusion in the same category as the cases I am about to describe, while the absence of histological detail leaves their nature quite problematical.

REPORT OF CASES.¹

I. Colcott Fox (*British Journal of Dermatology*, 1895, p. 91) (February 13, 1895). A girl, aged 11, with “an unusual ringed eruption on the fingers.”

¹ The figures in Roman numerals refer to the number of the respective case in the synopsis, the figures in ordinary numerals to the number in the series of the individual observer.

On the flexor aspect of the left ring finger there was a ring of eruption extending from the proximal phalanx to the distal phalanx and half-way up the sides of the finger. This oval ring was characterized by a smooth, rounded, projecting border, white in colour, doughy in consistence, quite $\frac{1}{8}$ in. wide and $\frac{1}{8}$ in. in height. The enclosed area was normal, or perhaps a little reddened. There were no subjective symptoms except that the border was slightly tender on pressure. On the little finger of the right hand was a similar ring, but rather smaller, and broken up in places into rounded nodules. The affection was cutaneous, and seemed to involve all the layers of the skin. The mother stated that the rings each began in a nodule, before Christmas, and gradually extended peripherally. There were no rheumatic nodules, and the only suspicion of rheumatism was some slight aching in the shoulders after walking. She had never suffered from rheumatic fever.

Fox considered the case an indolent form of inflammation, "allied to erythema elevatum diutinum."

II. Colcott Fox (*British Journal of Dermatology*, 1896, p. 15) (December 11, 1895). Ringed nodular eruption in an infant, aged 2.

On November 30 there were twelve or fifteen ringed erythema-like lesions, up to the size of a thumb-nail, on the buttocks and backs of thighs. They were in all stages, from a nodule the size of a split pea to the full-formed lesion; these were in the substance of the skin, felt thick, and projected slightly. They were indolent throughout, discrete, perfectly smooth, of a dull red colour, and depressed or "atrophic" (?) in the centre. The mother said the lesions appeared in the very hot weather—she thought in August—and none had gone away. She pointed out two recent lesions not yet ringed. The child was well nourished and healthy. On December 7 the eruption was declining and the continuous border breaking up into papules.

III. Dubreuilh's first case, "eruption circinée chronique de la main" (*Annales de Dermatologie*, 1895, p. 355).

The patient was a woman, aged 33, in fair general health but nervous and constipated, with no past illnesses of importance but some family history of rheumatism. She had suffered from chilblains up to the age of 16.

The disease had commenced five years previously with hard, pale swellings on the radial edge of the two index fingers and the left thumb. These slowly grew larger eccentrically, the skin becoming depressed in the centre, but this finally returned to normal state. Within the previous four or five months new lesions had appeared as lenticular patches on the dorsal surface of the first phalanx of the index and middle finger of both sides. These swellings were the size of a lentil, slightly paler than the normal skin, rounded, about 1 mm. high, and covered by true epidermis, which was slightly scaly. The raised edges were surrounded by a reddened border as hard as keloid, movable with the skin, and completely painless. On the left index finger the lesion formed

nearly a complete circle about 4 mm. large; on the left middle finger a semi-circle 2 mm. in diameter and on the middle finger and thumb segments of a circle of 1 cm. to 3 cm. in diameter. All the lesions disappeared rapidly under the use of ung. ichthyol., followed by Vidal's ointment.

The section taken from the left middle finger (and therefore of recent appearance) showed little change in the epidermis; the granular layer in the section of the raised edge was diminished, the other layers of the rete were normal. The epidermic interpapillary growths were flattened and the papillæ flattened and widened. In the middle zone of the corium there was a focus of diffuse cell infiltration, the cells being large, rich in protoplasm, and approximating to the fixed connective tissue cells; very few mast-cells were seen and no giant-cells. This focus of infiltration respected the superficial layer of the corium and the deeper layers, the sweat-glands being unchanged. The connective tissue and elastic tissue did not appear altered, the cells being in masses between the connective tissue fibres. In the central part of the focus of infiltration the nuclei coloured imperfectly, but the connective and elastic tissue continued unaltered in this zone (coagulation necrosis). No micro-organisms were discoverable by methylene blue, polychrome blue, or Gram-Weigert.

Dubreuilh considered the nearest analogue of this affection was lupus erythematosus, but points out that the clinical aspect of the latter disease when occurring on the hands does not recall in any way the appearance of this case.

Dubreuilh's subsequent cases (*Annales de Dermatologie*, 1905, p. 65).

IV. CASE 1.—H. B., aged 19 months. Good family and personal history. Disease had commenced four months previously with a group of papules, white, hard, smooth and umbilicated, over the tendo Achillis on both sides. They were not painful or itchy, and disappeared within two months. Fresh lesions, however, appeared, about fifteen altogether, of the same type—ringed and circinate groups, situated on the front of the knees and the legs. The enclosed skin was slightly depressed, a little purple, but otherwise normal. On the right leg one of these patches, the size of a franc piece, showed a centre not depressed, but raised above the level of the edge with hardened sclerodermic skin, and a deep infiltration below the patch, of the consistence of a lipoma.

Upon the palmar surface of the right index there was a group of these nodules, not ringed. Upon the right temple there was a subcutaneous tumour the size of a pea, hard and adherent to the periosteum (exostosis?). A year later other lesions had come on the feet and over the mastoid and on the forearm. Two types were distinguished in this case: (1) Superficial ringed patches on the feet, and (2) deep-seated nodules. The latter were of pasty consistence, not adherent to periosteum, but in the substance of the skin. There seemed a tendency to recrudescence in spring during about three years, the individual lesions lasting a twelvemonth or more. The lesion left no mark in disappearing.

V. CASE 2.—N. C., aged 26, a nervous but healthy woman. Disease had commenced four to five years previously with a white, hard pimple in the third interdigital space. This initial lesion grew peripherally and became depressed in centre, and disappeared, apparently spontaneously, in two months. Others appeared on the left index and back of left hand. They were quite painless and non-itchy, but when pressed laterally gave a sensation of pricking. They disappeared without scarring.

VI. CASE 3.—G. S., aged 18, in good health and with no family disease. The disease had commenced two years previously on the left hand, and had involuted when seen, but new lesions in the form of rings had appeared on the index; the rings were made up of small papules, hard, pale, ill demarcated, and forming part of substance of the skin. They were absolutely indolent, and even less sensitive than normal. This eruption disappeared within two months, but a year later fresh lesions came on the left index, which on pressure gave a sensation of pain as well as of pricking.

VII. An unpublished case of Dubreuilh's (communicated).

Boy, aged 3, well developed and healthy. When seen he had two nodular indolent circles. Disease had commenced eighteen months previously on the radial edge of the left hand, with a hard nodule which disappeared after some months. Some time later another lesion, a circle of nodules, made its appearance on the back of the same hand at the level of the metacarpo-phalangeal joint of the index. This circle was of the size of a lentil, 20 mm. by 15 mm.; it had persisted without enlarging for some time; it varied in the sense that it was more noticeable at certain times than at others, but it had never disappeared during the previous eight months; the circle had, however, greatly enlarged eccentrically, and had become bilobed so as to almost form two circles intersecting; and at the point of intersection, which corresponded to the initial site of the lesion during the previous month, there had appeared a nodule as large as a hemp seed and more prominent than the rest of the lesion. The edge of the circle was about 2 mm. to 3 mm. wide, hard and prominent; its colour was slightly paler than the surrounding skin and the epidermic covering; it seemed somewhat smoother than normal, probably because stretched, without, however, having lost the natural folds or markings of the skin, which remained visible with a lens.

The edge was perceived by palpation to be made up of a chaplet of hard nodules more or less confluent, of the size of a millet-seed, and of a nearly cartilaginous consistence, situated in the superficial layers of the skin, and embodied in it, the skin below and around being perfectly normal. The area of skin enclosed by this edge was perfectly normal, except that in one place there was a nodule larger than those forming the edge and of the same type. There was not the slightest infiltration or redness of the surrounding skin. The lesion was absolutely indolent, and neither itching, nor pain, nor tenderness was felt.

Over the right olecranon process there was an indolent subcutaneous nodule the size of a lentil, perhaps slightly adherent to the bone, independent of the

skin, which was normal. It was difficult to feel, and formed a slight relief when the part was stretched by forcible flexion of the elbow. The child was otherwise in perfect health. The father was rheumatic. The mother had been subject to migraine and urticaria for eighteen months. The child was treated with syrup of orange and sodium iodide.

Professor Dubreuilh kindly sent me several sections from this case, examination of which showed (see fig. 1):—

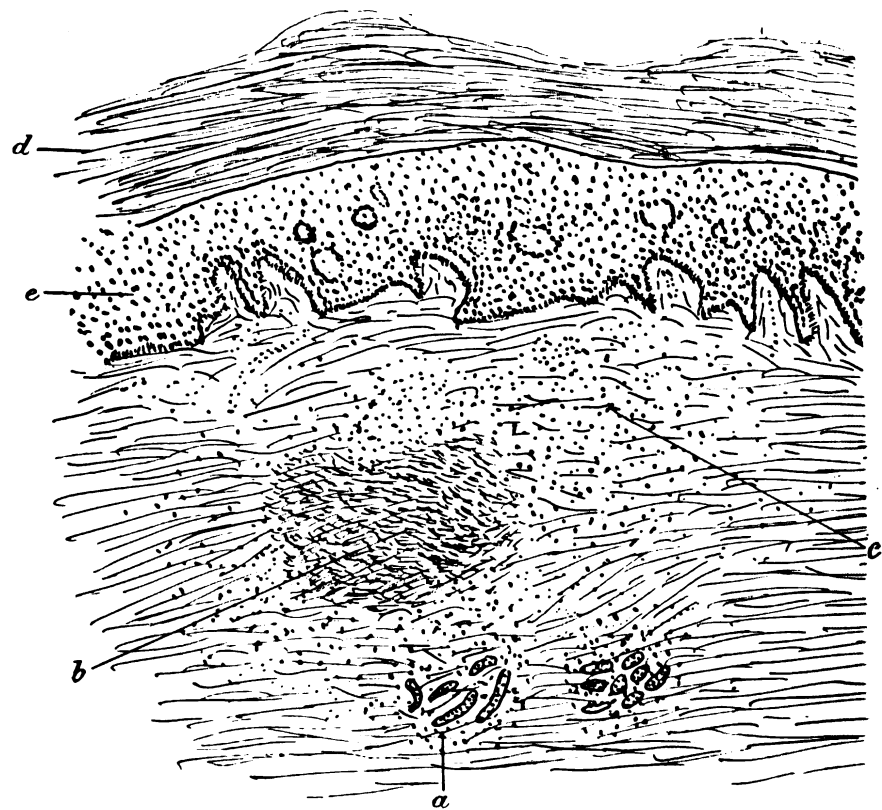


FIG. 1. (Drawn with camera lucida.)

Dubreuilh's case. (Leitz objective 3; ocular 2.)

- a Sweat-coils with infiltration.
- b Nodule of necrosis.
- c Broken up collagen with diffuse infiltration.
- d Stratum corneum thickened.
- e Rete thickened.

Section stained with cochineal-alum. (Lent by Professor Dubreuilh.)

The stratum corneum, granular layer and rete are all much thickened. There is a dense infiltration of cells in the middle and lower parts of the corium. The cells are in places diffusely scattered between the fibres of the collagen, in other places grouped in densely packed masses surrounded by collagen. The cells are largely composed of connective tissue corpuscles and large mononuclear cells. In one cell-mass of this kind, forming a microscopic nodule, the centre is degenerated and stains poorly, both as regards cells and connective tissue (necrosis). The sweat-coils seem rather large, and are surrounded by proliferated cells. The fat-zone was not included in the section. The appearance of the corium in this section is very like that of Case XLIV., p. 132. The thickening of the epidermis is unique in this case, as well as the increase of the granular layer.

VIII. Galloway's case (*British Journal of Dermatology*, 1899, p. 221) (first seen November, 1898).

Patient was a boy, aged 10, pale, undergrown, and subject to fits up to the age of 6. Never had rheumatism, and no family history of rheumatism. No visceral disease detected. The skin-lesions had persisted for at least three years, and had commenced as nodules near the knuckles, and had slowly spread to form rings consisting of a pale white elevated border showing circular or circinate outlines; the border was raised 1 mm. or 2 mm. above the skin and was about 3 mm. in breadth; it was smooth and did not present evidence of increase of epithelium nor of papillomatous structure; it was not reddened; it had the aspect of deep-seated infiltration of the cutis. The area of skin enclosed within the ring was apparently normal, but on more close examination was distinctly altered, normal wrinkles being no longer obvious, and slight signs of atrophy being present. The lesions had commenced as small papules or nodules in the centre of the areas afterwards affected, and had advanced by peripheral increase. The distribution was chiefly on the dorsal and lateral aspect of the fingers, the thumb, index and third finger of right, and thumb, index, third and fourth of left hand. One such lesion occurred on the pinna of the left ear.

He was treated with salicylic acid ointment and cod-liver oil internally. He improved, and within six months (May, 1899) the eruption had almost completely vanished. But three years later (May, 1902) this patient was again shown by Dr. Galloway with the history that the eruption had reappeared, chiefly on the fingers and with the same features as at the previous exhibition.

Histologically the lesion was found to consist of an infiltration of cells in the corium below the papillæ, the cells being arranged in clumps. The infiltration became less dense towards the hypoderm, but more profuse in the neighbourhood of the coil-glands. The cells were larger than ordinary leucocytes, rounded, and with a considerable quantity of protoplasm surrounding the nuclei. Others were elongated or spindle-shaped like connective tissue cells. Mast-cells were not numerous. There was great accumulation of cells, constituting a nodule, and the central area was apparently degenerated. Connective and elastic tissue

were partially displaced by the cell-masses, but were present even throughout areas in which degeneration had occurred (*see* fig. 3).

Dr. Galloway kindly lent me a photograph and a section from this case, which he has allowed me to reproduce (figs. 2 and 3).

Galloway considered the analogies with lichen planus to be the nearest, and hence gave the name lichen annularis to this group, carefully differentiating it in a footnote from lichen *planus* annularis (*loc. cit.*).



FIG. 2.

Dr. Galloway's case.

Radcliffe Crocker's cases (*British Journal of Dermatology*, 1902, p. 1).

IX. CASE 1.—Male, aged 20, in good health. Disease had commenced four years previously on right wrist and extensor aspect of root of thumb, with flat nodules the size of a split pea, pale red, and slightly itchy. Fresh lesions appeared on the back of the right and left hand, and on the fingers, on the scalp,

on the nape of the neck, over the mastoids, on the right ear, the right inner canthus and the right lower jaw. The patches were made up of "aggregations of papules" of a violaceous colour, finely scaly; they underwent involution in the centre and formed irregular gyrate patches. All patches showed a narrow red areola; some became yellowish in colour as they faded.

The patient was thin, and not strong, but showed no definite illness. Five sisters and one brother had "weak chests," but no deaths from phthisis were reported.

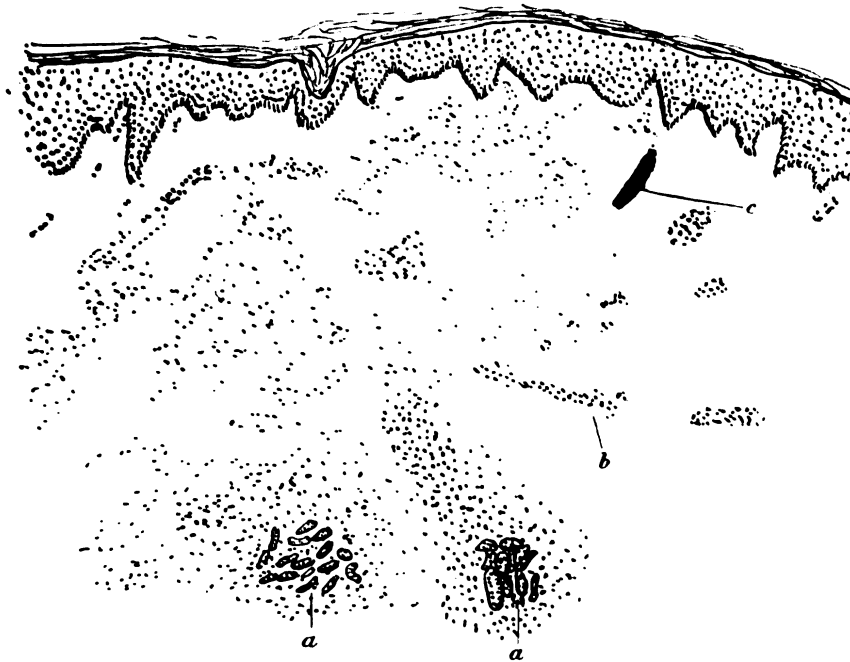


FIG. 3. (Drawn with camera lucida.)

Dr. Galloway's case. (Leitz objective 3; ocular 2.)

- a Sweat-coils with infiltration.
- b Vessel with infiltration.
- c Hair shaft.

Section stained with polychrome methylene blue. (Lent by Dr. Galloway.)

Dr. George Pernet was good enough to lend me two sections prepared by him from this case, examination of which showed the following features (fig. 4):—

The stratum corneum, the granular layer and rete generally are slightly thickened. There is a dense cell-infiltration in the pars reticularis and

hypoderm, the zone containing sweat-coils being especially involved. In this part there is an area of apparent destruction of tissue in the middle of a nodule of infiltration (*b*). Fat-lobules were not included in the section. The infiltration became less dense towards the upper part of the section. There were clumps of cells surrounded by connective tissue (*c*) in this part and a less marked, not aggregated infiltration, chiefly around vessels in the papillary body. The cells appeared to be connective tissue and mononuclear cells. No plasma-cells were seen in sections specially stained for them. The elastin was not stained in either of the sections submitted.

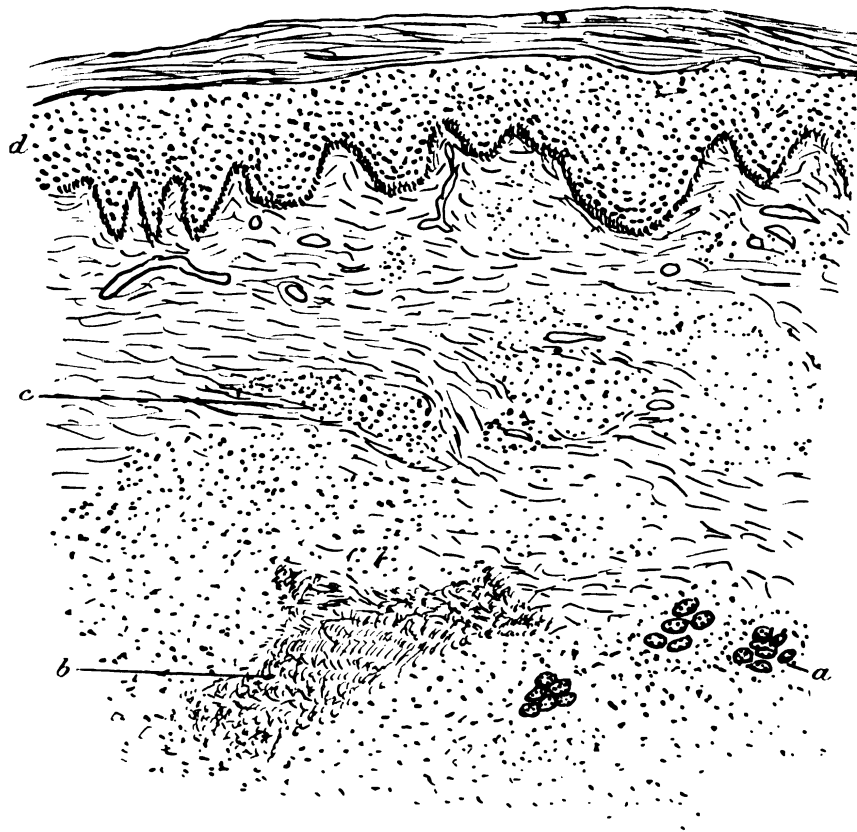


FIG. 4. (Drawn with camera lucida.)

Dr. Radcliffe Crocker's case, No. IX. (Leitz objective 3; ocular 2.)

- a* Sweat-coils with infiltration.
- b* Area in which feeble staining occurs (destruction of tissue).
- c* Clump of cells, walled in by collagen.
- d* Thickened rete and stratum corneum.

Stained with hæmatoxylin-eosin. (Section lent by Dr. Pernet.)

X. CASE 2.—Male, aged 21. Had had ordinary warts for two years. Lesion, when seen, was a gyrate patch with raised border of yellowish white colour, and with red areola, situated on back of right hand; this had commenced as a "mattery head," which had been picked, and had scabbed over. There was also a patch at the root of the right thumb, an annular patch made up of hemp-seed-sized papules: a nodule just above this: a group of nodules on the nape of the neck.

One brother had died of phthisis, aged 21. The patient showed no sign of ill-health.

XI. CASE 3.—Female, aged 52. Disease had been present two months; lesion consisted of circinate groups of papules and isolated nodules, partially coalesced and with depressed central area: one patch had come out "within three or four days." The situations were the left wrist, the nape of the neck, the ulnar border of the palm.

The patient was bronchitic: her father, mother, sisters, and three of her eleven children had died of phthisis.

Three months later one portion of the patch on the wrist had inflamed, apparently as a result of laundry work, and had become suppurative. No new lesions had appeared, but the original area had enlarged. Salicylic and creosote plaster seemed to have effected a cure three months later.

XII. CASE 4.—Male, aged 11. Disease had lasted a year: the first lesion was a flat wart, or described as such: it enlarged slowly and formed a ring. When seen there were white nodules and papules forming rings, with a pink border and dusky red, slightly atrophic centre. Some of the papules formed irregular, not ringed, groups. The situations were the left and right elbow (where the disease began), the wrists and the knees. The disease was cured with Beiersdorf's mercurial plasters. The patient had had sunstroke, but was healthy. Gouty (paternal) history. No mention of tuberculosis.

XIII. CASE 5.—Crocker and Pernet. Male, adult. The lesions consisted of a circinate patch made up of nodules on the metacarpo-phalangeal joint of right index: the duration and subsequent history are not given.

XIV. CASE 6.—Young adult male. Circinate lesions on backs of both hands and outer side of left index finger. The border was formed by elevated, smooth outline of bluish red colour, enclosing areas of skin more pigmented than normal, and showing slight signs of atrophy. No details are given of personal or family history, duration of disease, or result of treatment.

Pringle's cases.

XV. CASE 1 (*British Journal of Dermatology*, 1899, p. 435).—Male, aged 18. Family history good and personal health excellent.

Disease had commenced with a circular patch $\frac{3}{4}$ in. in diameter, composed of ten abruptly raised papules or nodules averaging the size of half a split pea, firm to the touch, bright pink in colour, obtuse at summit, which was capped

with thick, white, epidermic scales, their general appearance being distinctly "warty." The skin intermediate between nodules was normal in colour, but its natural lines were perhaps somewhat deepened. The skin surrounding the lesion was absolutely natural in every respect.

Three similar nodules, arranged in a line, existed immediately behind the left angle of the jaw, and half a dozen were arranged in crescentic fashion so as to form a fairly accurate semicircle behind the angle of the jaw on the right side of the neck. On the back of the right wrist was a horizontal band $\frac{3}{4}$ in. in length and about 1 in. in width, made up of very flat papules, angular in outline, pale greyish pink in colour, and shiny at the top, resembling a series of verrucæ planæ, or the warty type of lichen planus. Over forehead in both temporal regions, and extending about 2 in. into the scalp, were more than twenty distinctly inflammatory papules, not grouped, with adherent dry scales and of warty appearance.

The patient stated that the "spots" had appeared on the neck eight months previously, and that the grouping became noticed four months later and had remained unchanged for four months. The other lesion had come later. There was occasional itching.

In the discussion which followed the exhibition Dr. Radcliffe Crocker is recorded as having identified this case as similar to the cases pictured by him in his "Atlas" as variants of lupus erythematosus, with some resemblances to lichen planus; Dr. Galloway as having thought the wrist lesions might be an early stage of the condition described by him as lichen annularis.

No sections were obtained in this case.

XVI. CASE 2.—This was a boy, aged about 10. Shown at the Dermatological Society of London on the same day as my case of H. M. (p. 130), and it was recognized by all present that the two children had the same disease. The boy had ringed lesions of exactly the same type as the girl, some of which were situated on the thighs as well as on the hands. Notes of the case were mislaid or lost, so that no details could be furnished, and he was not apparently seen again; but a section was procured from one of the lesions, and I owe to Dr. Whitfield the gift of one of these sections, examination of which showed (fig. 5):—

The epidermis was unaltered. The section showed very little beyond distinctly enlarged sweat-coils, round which a slight cell-proliferation was visible. With a low power it gave the appearance of a nodule in the deepest part of the corium, and from this as a centre a few rows of cells extended upwards into the upper part of the cutis. The cells were chiefly connective tissue cells.

XVII. Dr. Sequeira's case (*British Journal of Dermatology*, 1902, p. 270). (Dermatological Society of London, June, 1902.)

CASE 1.—Male, aged 28, with "ringed eruption" upon dorsal surface of hands and fingers, which had begun two and a half years previously. There was

history of phthisis on the mother's side; the patient himself was pale and thin, suffering from indigestion and bad teeth, and showing symptoms of cardiac disease. On the dorsum of both hands there was an irregularly oval patch, about the size of half a crown; the centre of each patch was "somewhat atrophic," and round the margin there were closely set, smooth, pale red "spots," free from scales, measuring from $\frac{1}{12}$ in. to $\frac{1}{8}$ in. across, circular, not angular as in lichen planus. Similar, but smaller, ringed patches were present on the dorsum of both middle fingers, and two smaller and more recent "spots" on the back of the right middle finger.

No histological examination was obtained. Dr. Sequeira, in a letter dated March, 1908, writes: "I did not see the patient again after the meeting

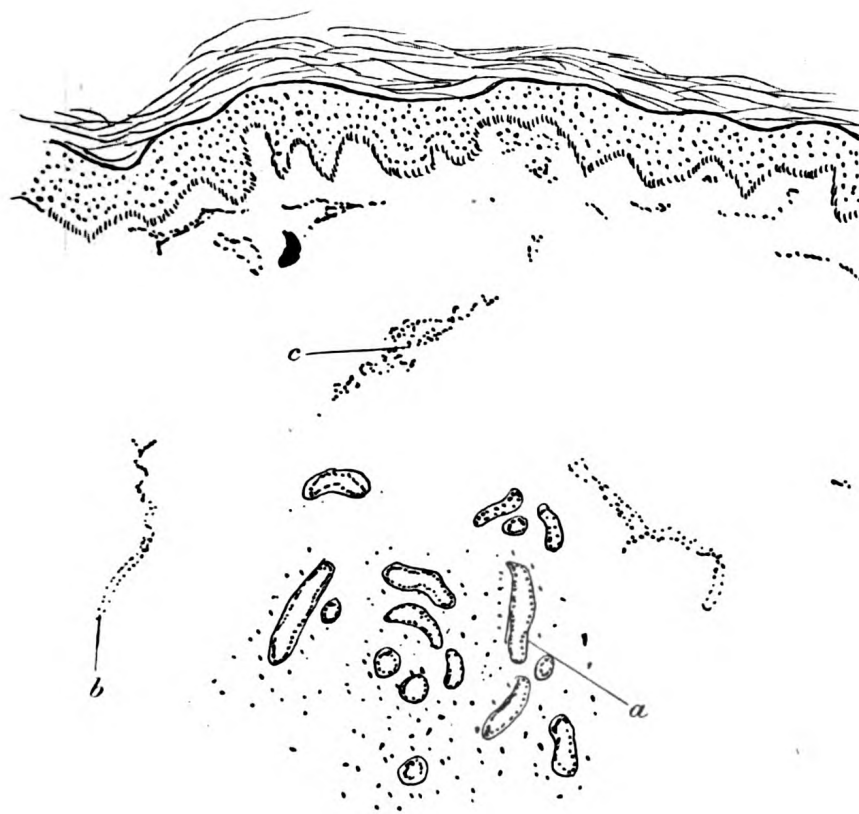


FIG. 5.

Pringle's case. (Leitz objective 3; ocular 2.)

- a* Dilated sweat-ducts and coils with slight cell-infiltration.
- b* Vessel.
- c* Vessel with infiltration.

Stained with rubin-orange-haematoxylin. (Lent by Dr. Whitfield.)

(June, 1902), but some six months later, wishing to show the case to my class, I wrote, and the patient came to see me at the hospital. The lesions had entirely disappeared, apparently spontaneously. There had been no treatment."

Dr. J. H. Sequeira has furnished me with notes of the following additional cases:—

XVIII. CASE 2.—F. H., aged 8 (fig. 6). A characteristic example of "granuloma annulare." The mother was indefinite as to its exact duration, but it had lasted "several months." When seen in June, 1904, she had a

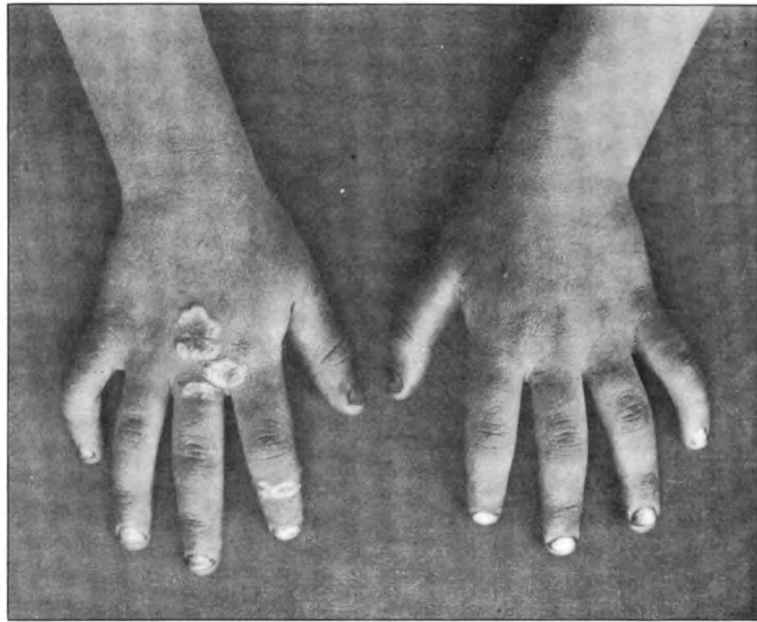


FIG. 6.

ringed lesion, the size of a shilling, on the dorsum of the right index finger, just below the nail; the ring was composed of nodules, the enclosed central area being smooth. There were no subjective symptoms. A larger patch, the size of a two-shilling piece, was situated on the back of the same hand, below the cleft between the index and middle fingers. This patch also consisted of nodules forming a ring. There was another ring, the size of a sixpence, composed of nodules, on the back of the right wrist. There was a

ring, the size of a shilling, on the back of the left hand, with exactly the same characters.

The patient was ordered to rub ung. acid. salicylic. into these lesions, and the disease completely cleared up in less than a month.

XIX. CASE 3.—D. B., a Polish woman, aged 21. She was seen on December 12, 1907, when the disease had lasted for eight months. When seen there was a ring, the size of a two-shilling piece, on the back of the right wrist, and a similar but slightly smaller ring on the back of the left wrist. There was also a ring on the knuckle of the index finger at the junction of the proximal and the next phalanx. This had the same characters as the other lesions—a ring, composed of nodules, with non-atrophic centre. No irritation was complained of. This patient was seen only once. Ung. hyd. oxid. rubr. was ordered, and the case presumably resulted in a cure.

XX. CASE 4.—A Polish girl, aged 8, seen on February 19, 1907, in whom a diagnosis of "ringed eruption" was made, but with some reservation. There were ringed patches on the palms of both hands and on the front of each ankle. No history was obtained as to the actual duration of these. There was some irritation in connection with the patches, and a liniment of menthol was ordered. The patient did not attend again.

XXI. Rasch and Gregersen's case (*Archiv für Dermatologie*, 1903, Bd. lxiv., p. 337).

Patient was a female, aged 33, with a good family history. The patient herself was conspicuously nervous, but otherwise well. No symptoms of tuberculosis. Eight years previously she had had, on the dorsal surface of left index, a whitish tumour of the skin, which she had destroyed herself with acid after it had lasted for a year. There was a round, white scar left by this lesion, of about 1 cm. in diameter. For six years after she had nothing the matter with the skin, then there appeared again similar tumours on the fingers of the right hand. These began as quite small white prominences in the skin; some of them grew slowly to a cross section of about 1 cm., others involuted spontaneously, after lasting some months, without leaving any distinct mark or scar. There was no itching or smarting or subjective sensation of any kind. Patient was fair, pale, and rather thin. Examination showed nothing abnormal, with the exception of the condition of the fingers. Here there were four little swellings, which were all on the dorsal surface of the fingers of the right hand. On the index, between the first phalanx and the knuckle and between the first and second phalanges respectively, there were two tumours, the first about 4 mm. in diameter and the second 1 cm. in diameter. On the medius was found one small tumour, about 5 mm. in diameter, and at the base of the little finger a swelling about 1 cm. in diameter. In the centre it showed an almost entire regression and so formed a ring. The skin within the ring was smooth, faintly atrophic; all the nodules were dry, white or whitish yellow in colour, like old ivory, with

smooth, wax-like, shiny summits. They had their seat in the substance of the corium, and were movable on the underlying tissue. The only trace left by the tumours was a lentil-sized spot where the skin was slightly atrophic.

Nine months later the patient wrote that all the tumours, which had afterwards grown somewhat larger, suddenly entirely disappeared during a feverish attack of undetermined nature, leaving pale red spots.

Microscopic Examination.—A piece of skin carrying a ring-patch was excised from the base of the fifth finger, was fixed in formol-Müller, hardened in alcohol, imbedded in paraffin, and serial sections cut and stained with von Gieson-Hansen, with hæmatoxylin-eosin, with thionine, with elastic-fibre stains (Unna-Taenzer), with protoplasm stain of Unna, and with Ziehl-Nielsen. In the peripheral part of the tumour there were found in the earlier sections in the true skin anastomosed blood-containing vessels. Their endothelium was natural and the wall quite thin. They were surrounded by a cell-mantle, partly consisting of round-cells, partly of cells of the type of connective tissue. Some of these cells had long, spindle-shaped small nuclei, and their appearance did not differ from the usual connective tissue cell. Others were plumper, with round or oval nuclei. These vessel-containing connective tissue strands lay in the cutis proper, while the papillary body showed nothing abnormal; it was separated from the strands of cells already described by a normal-looking, thin connective tissue stratum. If one followed these strands to the tumour-mass one found that the perivascular cell-infiltration gained in breadth and formed a thick sheath on the finer vessels. Little masses of round-cells were seen between the connective tissue, which was also greatly increased in quantity. Between the connective tissue bundles there were also lines of cells which had quite the same aspect as those around the vessels. These cell-infiltrations in the meshes of the connective tissue were more strongly defined the further one got to the centre of the nodule. These cell-rows were in connection with the vessel-bearing rows of cells in the periphery of the tumour, and contained often quite small vessels, which consisted of a simple endothelial tube. The endothelial cells were always normal, without sign of proliferation. The cell-forms in the central part of the tumour were of extraordinarily manifold shapes; cells with round or oval nuclei were in preponderating number, also pear-shaped cells with plump, rod-like, crooked, and other kinds of nuclei. All these nuclei had a finely granulated protoplasm in which single or few dot-shaped distinct nuclear bodies were found. The *cell-body* was also of varying forms; often it was quite big, with distinct protoplasmic processes, which were sometimes short, sometimes long and fine. Often the cell-body was spindle-shaped, or it formed a small collection round the nucleus, slightly filamentous at the edge. Mitotic figures were not observed, but many cells contained two nuclei, one being often placed alongside the other.

Occasionally one found bigger cells that contained as many as four nuclei which partly covered one another. True giant-cells were not observed anywhere. By reason of the accumulation of cells the connective tissue bundles

were dissociated and were found as thinner or thicker divisions between the cell-masses, and merged without any sharp demarcation into apparently normal tissue. In preparations stained with von Gieson-Hansen very fine connective tissue fibres were found between the cells, a sparse inter-cellular substance forming.

On examination with an immersion lens it would appear as if these fine connective tissue fibres were formed from cell-processes. Normal connective tissue cells were not met with in the cell-masses, and it seemed altogether as if not only the perivascular (lymph space) connective tissue cells proliferated, but that also the connective tissue at some distance from the vessels took part in the process.

Besides the already named changes, one found, in the deeper part of the tumour-tissue, irregularly formed areas in which the cells had undergone destruction. The necrosis became more marked and deeper the more one penetrated into the tumour tissue; moreover, it appeared with greater irregularity in that it showed bigger or smaller foci. In these places were found extensive myxomatous metamorphoses. Thread-like masses were seen in the peripheral part of the necrotic areas, which showed mucin reaction with thionine. The mucous degeneration of cells became more marked the further one got into the central part of the necrosed area, and mucin formation in the cell-body was visibly accompanied by a disappearance of the cells, in that the contours of these became less distinct and disappeared, and the nuclei became paler and split up into granules and dispersed, so that in the centre of the necrosed areas one found only thread-like mucin-masses that here and there contained debris of nuclei. Between these mucin-masses were found connective tissue bundles that showed up sharply as light blue trabeculae between the red-violet mucin-masses, and therefore did not appear to have undergone myxomatous changes. The transition of the necrotic areas to the living connective tissue was not well defined.

In the last of the serial sections one found only on one side of the section the already mentioned cell-proliferation, while on the other side of the section (which contained the central regression of the ring-shaped lesion) was found "partly compact fibrotic, partly loose fibrillar, connective tissue." This last part seemed vascularized very much like normal skin, and the vessels were apparently quite normal, with the exception of a few round-cell masses in the periphery. In the neighbourhood of the cell-proliferation zone the connective tissue was infiltrated with rod-like nuclei and with long, thin connective tissue cells that were continued into fibres. Here the connective tissue bundles were thickly permeated with small, long clefts. On the other side one found the connective tissue looser and not so rich in cells.

The transition from the cell-proliferation zone to the described part (which was about half as thick as the part of the skin containing the tumour) took place quite evenly and gradually. The masses of the elastic tissue appeared normal in the places where no cell-proliferation was to be found. The sub-epithelial meshes in the papillary bodies were everywhere well maintained,

and appeared in orcein-stained sections as a plexus with extraordinarily fine threads. In the places where the cell-proliferations were observed, and where the tissue was wholly made up of cells, the elastic tissue was entirely absent. It appeared also to be missing in the necrosed areas, although the collagen bundles had here not been destroyed. Where the cell-strands were to be found, and where the diseased tissue appeared between the connective tissue bundles, one found a not inconsiderable quantity of elastic tissue, which appeared in several places as if broken into fragments. In other places, and in the broader bands of connective tissue, it was seen as longer or shorter, curled or wavy, partly anastomosed fibres.

The small vessels round which the peripheral part of the cell-proliferation was localized contained no elastic tissue; in the bigger vessels the conditions were normal. In the epidermis, as well as in the sweat-glands, no pathological changes were found. No plasma-cells were found. Ehrlich's mast-cells occurred occasionally, chiefly in the papillary body; round the vessels of the sweat-glands single mast-cells were found. Between the proliferated cells in the cell-rows and in the cell-masses they were not found. There were no bacteria visible.

Brocq's cases.

XXII. CASE 1 (*Annales de Dermatologie*, 1904, p. 1089).—Male "child," with "circinations," which had persisted for several months on the backs of the fingers, and partly on the sides and palmar surface; the rings had a diameter of 1 cm. to 2 cm.; their edges were unbroken and enclosed a slightly depressed central area. Besides the rings there were nodular "patches," which were extremely indolent and which grew larger eccentrically, and in disappearing left definitely "cicatrical" appearances. The earliest lesion seemed to commence with a central wart, according to the maternal history. Vidal's plaster produced improvement. The child was otherwise perfectly well. Brocq remarks at the close of his description that he had considered possible a connection between these cases and pulmonary tuberculosis, and consequently this affection "serait à rapprocher des sarcoïdes."

XXIII. CASE 2 ("Traité élémentaire de Dermatologie," ii., p. 277).—A man; the affection had lasted for more than a year, and was situated on the dorsal surface of the fingers and the metacarpo-phalangeal joints. It was diagnosed as a special form of lupus, and treated with electro-cautery.

XXIV. CASE 3 (*ibid.*).—A young girl, with lesions on the fingers and hands; they were cured by the application of creosoted salicylic-pyrogallie plasters.

XXV. CASE 4 (*ibid.*).—Girl, aged 8, with lesions on the knees and tibio-tarsal articulation; they had lasted for two years.

In a courteous communication Brocq expresses his regret at the loss of the notes of these cases, which must therefore remain incomplete.

He very kindly sent me several sections from his first case. Examination of these showed the following features (fig. 7) :—

The stratum corneum is slightly thickened; the granular layer is two or three cells thick, the rete normal. Focal accumulations of cells are seen almost all through the section, increasing in denseness as the hypoderm is approached. These masses of cells are seen to surround sweat-glands and coils, enlarged vessels and hair-shafts, and they tend to become encapsuled by the dislocated connective and elastic tissue. But in some parts, especially deeper in the section, the collagen and elastin are split up and fragments lie among the

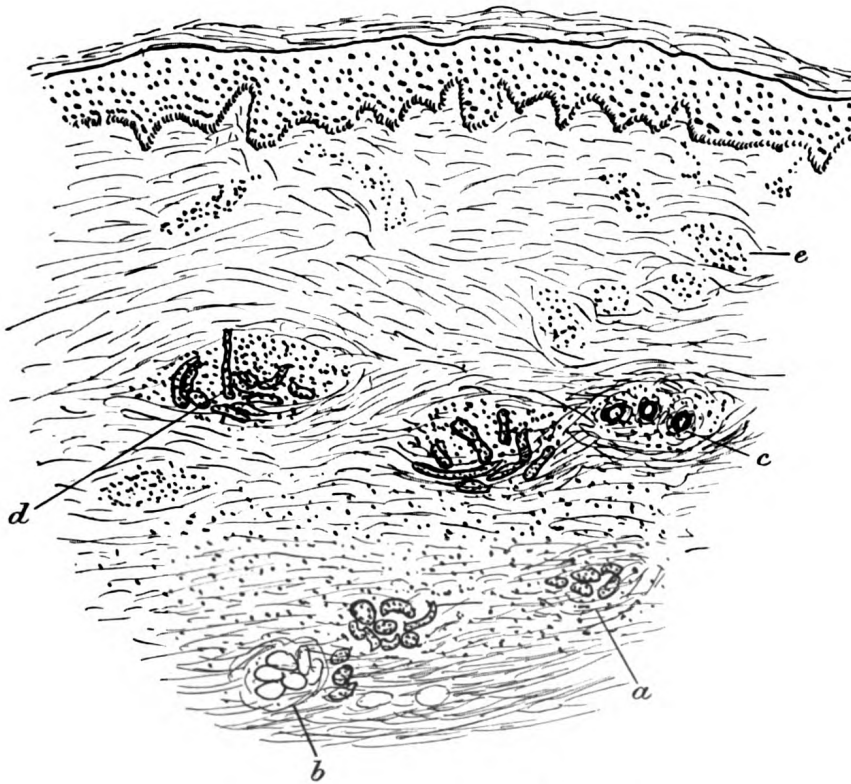


FIG. 7. (Drawn with camera lucida.)

Brocq's case. (Leitz objective 3; ocular 2.)

- a Sweat-coils with infiltration.
- b Fat lobules with fibrosis.
- c Thickened vessels with infiltration.
- d Sweat-ducts, forming centre of a nodule of infiltration, walled in by collagen.

Stained with von Gieson-Hansen.

infiltrating cells. In portions of the section the collagen stains with difficulty, as if it had undergone necrosis in circumscribed areas. Large masses of the fatty lobules of the hypoderm have become converted into fibrous tissue (sclerosis), which is also infiltrated with scattered cells; and the vessels in this zone are greatly dilated, thickened, and numerous, and surrounded by infiltrating cells; in many of the vessels the lumen is blocked and the vessel converted into a fibrous cord. The cells consist of large mononuclear cells, connective tissue corpuscles and epithelioid cells. No giant-cells were seen, and no undue proportion of mast-cells.

XXVI. Audry's case (*Annales de Dermatologie*, 1904, p. 9).

Female, aged 50, who for eight months had had lesions "like those described by Colcott Fox and Dubreuilh." On both hands, especially on the right, on the lateral border of the middle and ring fingers, there were rings formed by thin edge of violaceous pink colour, very firm consistence, slightly scaly and shiny: these ringed patches seemed formed by the juxtaposition of hard, pink nodules. The lesion commenced with a nodule which healed in the centre and spread peripherally. The skin enclosed was almost absolutely normal. There was no pain or itching. Histological examination showed a condition of affairs "like Dubreuilh's case."

XXVII. Model of case of Quinquaud's (dated 1891) in the St. Louis Hospital Museum.

Identified from model by Crocker as clinically like his cases of erythema elevatum diutinum. Dr. Wickham, the courteous administrator of the Museum, was unable to furnish any further details than those contained in the catalogue, viz.: "No. 1599. Fibromes multiples nodulaires des extrémités. Diagnostic histologique: Fibrome fasciculé, mains."

It is interesting in this connection to call attention to Dr. Hyde's addendum to Dr. Montgomery's case (p. 119). Was the case, clinically regarded by Hyde and Montgomery as granuloma annulare, histologically as keloid, of the same type as this St. Louis model (*vide* below)?

XXVIII. Dr. T. D. Savill's case (*British Journal of Dermatology*, 1905, p. 23).

Male, aged 44, with a persistent ringed eruption situated upon the neck, chest, and upper limbs. The condition had lasted for eight months. From the scanty notes of the case, which Dr. Savill has been kind enough to lend to me, it would appear that the diagnosis at first suggested was tinea, then syphilis, and on this latest hypothesis mercury and iodides had been given. He was under this treatment for five months, and then appears to have been lost sight of. He was shown at the Dermatological Society of Great Britain and Ireland, and the diagnosis of lichen annularis suggested.

Microscopically the section (kindly lent by Dr. Savill) showed (fig. 8) much localized thickening of the stratum corneum, an increase in the thickness of the

rete with a very much broader granular zone (five or six cells thick) than usual, and with a copious, localized infiltration of cells in the papillary zone of the corium directly under the epidermis and restricted to the superficial layer entirely. This distribution of the infiltration is unlike that seen in any other of the sections I have examined, and I cannot think that the diagnosis of lichen annularis was correct in the light of the histological appearances, which are certainly more like those of lichen planus.

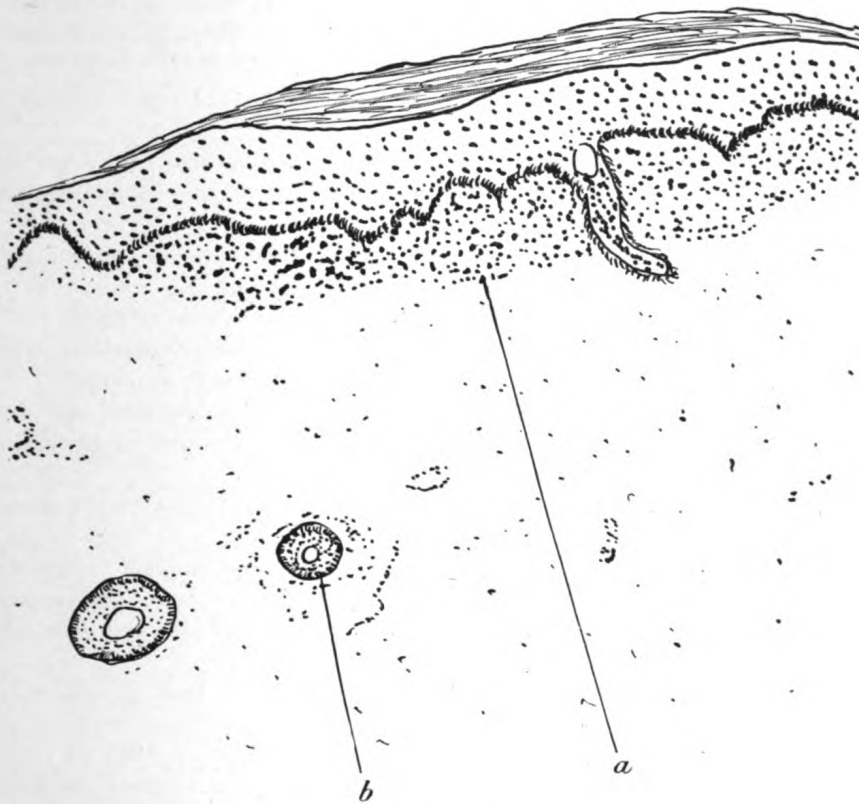


FIG. 8. (Drawn with camera lucida.)

Savill's case. (Leitz objective 3; ocular 2.)

- a* Dense cell-infiltration of papillary body.
b Hair shaft in cross section.

Stained with polychrome methylene blue. (Lent by Dr. Savill.)

XXIX. Case shown by Sir Cooper Perry and Mr. Sichel (*British Journal of Dermatology*, 1905, p. 61) (communicated by Mr. Sichel, 1908).

S. B., a boy aged 8, presented himself at Guy's Hospital on January 3, 1905, suffering from a nodular rash affecting sparsely the extensor surfaces of both hands and feet. The tendency to the formation of circular patches—about the size of threepenny-bits—was well marked, especially on the hands, where the centres surrounded by the nodules were clear but rough. The spots on the hands and feet were said to have begun about two weeks previously. There was no marked scaliness.

Previous History.—Measles four years ago, and "rheumatism" twice before that, the last attack followed by "inflammation of the kidneys"; his mother also stated that he had had a similar rash to the present in the previous summer, which went away.

Family History.—Father and mother alive and healthy; one brother and one sister, both alive and healthy.

Patient himself is pale but well nourished. No cardiac bruit, but heart sounds not quite so clear as they should be. When shown he had an inter-current herpes zoster (abdomen).

January 5, 1905.—A fresh patch noticed in right lumbar region, also a small, ring-shaped, bruise-like stain in left lumbar region.

January 6.—Urine acid, specific gravity 1024; no albumin or sugar.

January 10.—Slight attack of tonsillitis; urine faintly alkaline, specific gravity 1016. No albumin or sugar, phosphates came down on boiling.

January 17.—Rash of herpes on abdomen almost entirely cleared up. Spots on hands and feet much faded, but otherwise not much changed; a few nodules, like "rheumatic nodules," on dorsum of right foot.

January 18.—Urine clear, acid, no albumin, no sugar, no excess of phosphates.

February 21.—Rings all bigger and often not quite complete; the nodules keep separate and do not run into each other. There have also appeared numerous nodules in periosteum (?) of left temporal region, the skin over which is unaffected, not painful or tender.

March 8.—Two nodules on back of left ear and one on back of right ear.

March 15.—Painted with collodion salicylate.

March 23.—Some fresh spots on right foot.

Treatment was continued once or twice weekly with collodion salicylate (5j. to 3j.), and the spots gradually faded. The subcutaneous nodules became smaller without any application in temporal region and ears.

When he was again shown on March 8 Galloway recognized the case as one of lichen annularis. G. S.

Histology of Perry and Sichel's case. Dr. Arthur Whitfield very kindly lent me a section from this case, from which the following examination was made (fig. 9):—

The epidermis was normal; the granular layer was about three to four cells thick; the rete was not thickened. In the deeper part of the corium a nodule of

cell-proliferation was seen with a low power, which, with higher magnification, was seen to be centred round dilated sweat-coils. This cell-proliferation extended down to the cut margin of the section at the junction of the subcutaneous tissue, and strands of cells were seen ascending from this tumour-formation vertically upwards, round enlarged sweat-ducts, to the middle of the corium. The papillary body was free from infiltration. The cells seemed to be composed chiefly of connective tissue corpuscles, with elongated nuclei. Some large mononuclears also formed part of the cell-mass.

No data as to elastin were furnished by the section. The collagen was dissociated by the cell-masses, which lay between the bundles in nodular foci, but appeared elsewhere normal.

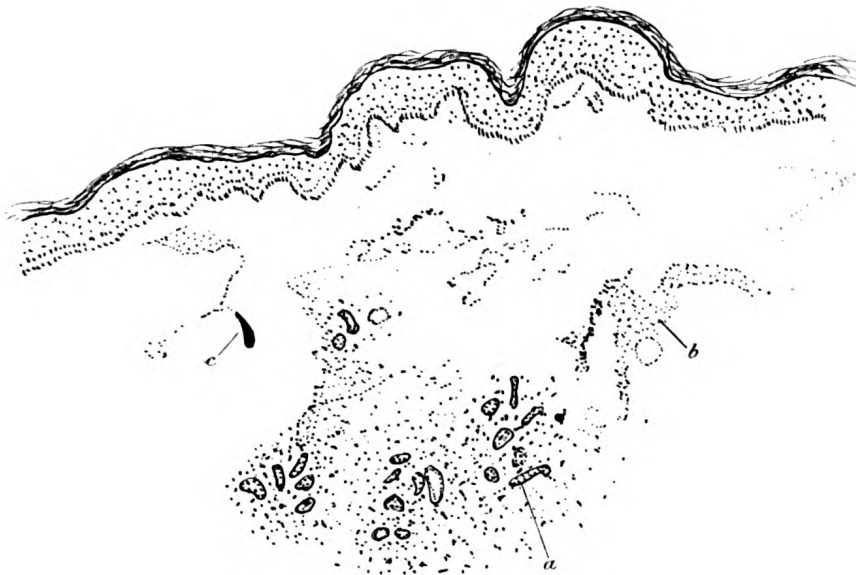


FIG. 9. (Drawn with camera lucida.)

Perry and Sichel's case. (Leitz objective 3; ocular 2.)

- a* Dilated sweat-coils with infiltration.
- b* Perivascular infiltration.
- c* Hair shaft.

Section stained with rubin-orange-hæmatoxylin. (Lent by Dr. Whitfield.)

XXX. Dr. Leslie Roberts's case (communicated). Ringed eruption on the foot, 1904. (Fig. 10 from water-colour drawing lent by Dr. Leslie Roberts.)

The patient was a girl aged 9, and the disease had been first noticed a year previously. There were no subjective sensations, and the original patch felt "like a little hard lump under the skin." The disease spread slowly. The

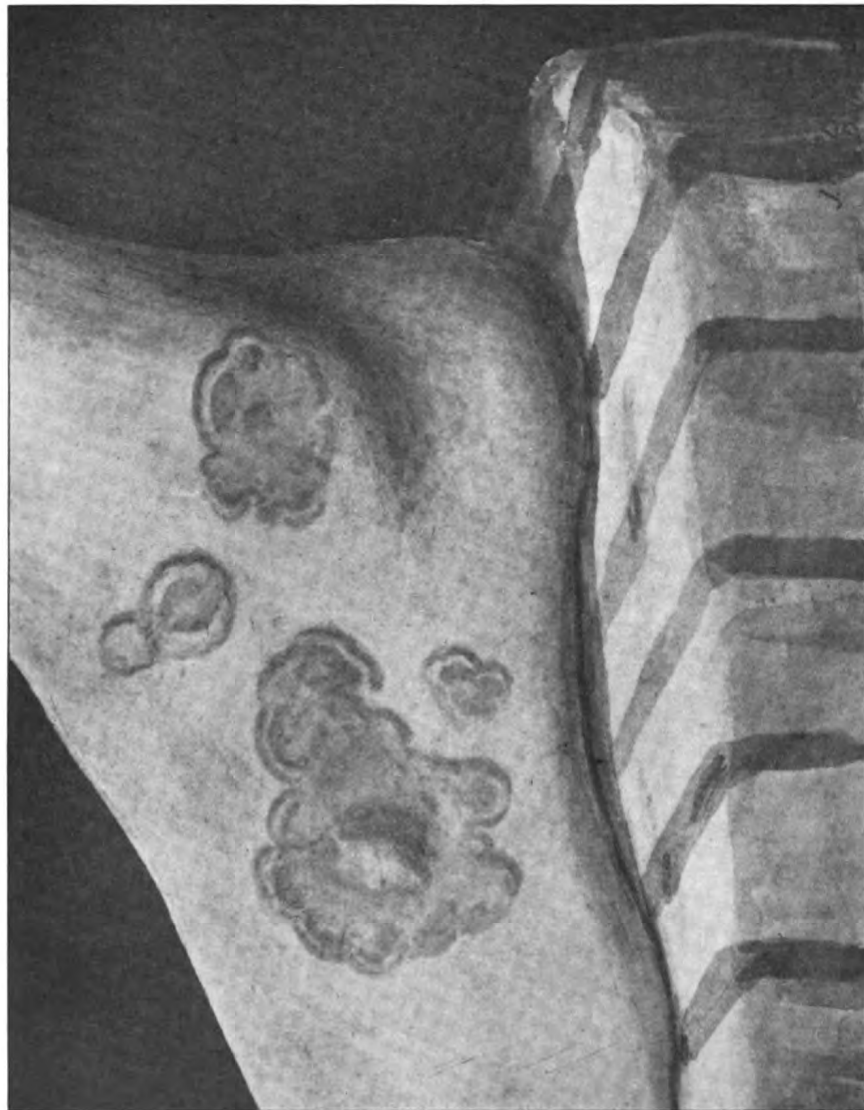


FIG. 10.
Leslie Roberts's case. (From water-colour drawing lent by Dr. Leslie Roberts.)

eruption occupied an area of 3 in. on the outer side of the left foot, reaching a point slightly above the malleolus. When the patient was lying down the colour of the patches was light red, changing to bluish red when the patient

stood erect. When the leg was elevated and the blood pressed out of the foot the rings assumed a dull white aspect. The patches formed rings, the margins slightly elevated, of dull ivory colour, presenting a waxy, glistening surface. The hyperæmia varied also with the temperature; on cold days it was more pronounced, becoming less visible in warm weather. The progress of the disease was very slow, persisting for many months, and spreading centrifugally. There was no inflammatory reaction. Under treatment the rings disappeared, leaving no scar.

In the section lent for examination by Dr. Leslie Roberts little more than the epidermis is included in the excision. No changes were apparent in that. Dr. Leslie Roberts proposes the name "*acanthoma annulare*" in substitution for *granuloma annulare*. In the absence of acanthosis this name seems undesirable.

XXXI. Case communicated by Dr. F. H. Montgomery in a letter dated February 21, 1908. (Case referred to by Dr. Galloway, *British Journal of Dermatology*, 1902, p. 218. Fig. 11 from photograph by Dr. Montgomery, lent by Dr. Galloway.)

"The case of ringed eruption concerning which you ask occurred in the son of one of my colleagues in the graduate school with which I was connected some years ago. The boy was brought to me in September, 1899. He was then a rather delicate boy, aged 16. The cutaneous trouble began with what he called 'a small smooth wart' on the radial side of the second joint of the left index finger in the summer of 1897. It had gradually spread centrifugally. At the time of my examination it extended in irregularly circinate lines about $\frac{1}{2}$ in. on to the radial surface of the two adjoining phalanges, and slightly on to the dorsal and palmar surfaces. The borders were elevated 2 mm. or 3 mm., from 2 mm. to 6 mm. in width, and were more or less distinctly subdivided into individual nodules. The border in colour and density suggested somewhat a keloid, being hard and smooth and presenting no evidence of inflammation or of epithelial growth. The central portion over which the growth had passed seemed to be practically normal; there was no evidence of scar formation.

"I saw the boy again two and a half years later. At this time his father said the lesions had increased until they reached the distal phalanx of the finger, and then, without much treatment aside from irregular applications of a 50 per cent. solution of ichthyol which I recommended, the lesions gradually disappeared until at the time I saw him there were left two slightly umbilicated nodules about the diameter of a small pea. These ultimately disappeared completely."

To this report Dr. Nevins-Hyde adds:—

"It is proper to say, in order to show there can be errors made by the best meaning of physicians, that about six or eight months ago a patient came to us

with a lesion on the left leg which was so precisely similar to those of the Galloway-Montgomery case that I at once called Dr. Montgomery in to see her. In this case the patient was a woman, and he suggested to me without very much hesitation that it was another instance of granuloma annulare. There seemed to me, however, to be some distinction here, and this suggestion was based on the special hardness of the underlying tissue. As the ringed eruption did not disappear under what we thought to be appropriate treatment, we excised it and examined it with special care, and found after staining a section of the lesion simply a circinate keloid! I give you this information as it may help you in your critique in other supposed instances of the disorder.



FIG. 11.

Case of Dr. Hyde and Dr. Montgomery. (From photograph by Dr. Montgomery, lent by Dr. Galloway.)

Externally, however, this patch looked precisely like the others we have seen (*vide* fig. 16 following).

"It might interest you further to know that neither Dr. Montgomery nor myself has seen any such conditions save in the one case which we photographed and which is referred to above."

XXXII. Professor Jadassohn's cases (communicated by Professor Jadassohn).

CASE 1.—Mme. X., aged 59. The eruption had commenced two or three years previously in the inguinal region of both sides. Later, it appeared about the axillæ, and on the elbows and knees, on the left side prior to its appearance on the right. There were no subjective symptoms in connection with the eruption, and the patient had no family history of importance, and was herself a stout healthy woman, possibly with "gouty" tendency, and of somewhat nervous temperament, suffering from insomnia.

Distribution of the Eruption.—This was symmetric, but everywhere more pronounced on the left than on the right side. Near the axillæ there were very large patches extending on to the surface of the chest and arms. The central part was smooth and perhaps atrophic to a slight degree; the hairs had not fallen out, but the follicles in the centre were somewhat dilated, without, however, being "cornified." In these parts there were some nodules the size of a pin's head, white, firm, and smooth, resembling follicular cicatrices. The edges of the patches were thin (about 1 mm. wide), irregular, very little raised, of a pale, slightly bluish tint, and very little infiltrated. Beyond the limits of the patches there were some macules, very slightly infiltrated and raised, and pale bluish in colour. On the right wall of the chest there were some isolated circinate groups composed of small nodules, sometimes perhaps follicular, and of a pale bluish colour, occasionally even red. The nodules in the middle of these groups were generally paler and less raised, with a more pronounced edge and more circumscribed. On the left elbow, above the olecranon, there was a patch the size of a shilling, which was more raised, more infiltrated, and redder. The infiltration was general, but the centre was somewhat depressed. A little lower, over the ulna, there was a row of pale pink small nodules. Over the wrist there was another group, about the size of a sixpence, of nodules, very small and pale. On the left elbow, and on the inner sides of both knees, there were some flat nodules, ungrouped and isolated, of a pale pink. (The patient stated that the large patches had all commenced in this way.) In the inguinal regions there were some large patches (from which the biopsy was made) exactly like those near the axilla. In no part was there any scaling, scratching, or follicular keratosis. The face, neck, nape, and the rest of the body remained wholly free.

Liq. arsenicalis in ℥iij. to ℥x. doses was prescribed, and a mercurial plaster and ointment. This appeared to benefit the condition, the effect being apparently due more to the arsenic than to the local remedies, since the eruption improved in positions where no local treatment was used. The condition had recurred from time to time, and was now again troublesome.

Professor Jadassohn was kind enough to send me a section from this case (fig. 12). There were less conspicuous changes in the skin than in some of the other cases examined, but on the whole I think we have to do with the same class of phenomena.

There are a few collections of cells, encapsuled by connective tissue and lying chiefly in the middle zones of the corium. These cells consist, for the most part, of vividly stained mononuclears, with many connective tissue corpuscles and few epithelioid cells; mast-cells are not numerous. The sweat-ducts and coils are in parts of the section surrounded by a fairly dense cell-infiltration. There are also localized areas where the connective tissue and elastic fibres are broken up and interspersed with cells. The epidermis appears exceptionally thin, but the section was taken, I understand, from the inguinal region, which explains this appearance. The granular layer is "one cell thick." There is only a small part of the fat-zone included in this section, and in a portion of this there appears to be a slight inflammatory infiltration.

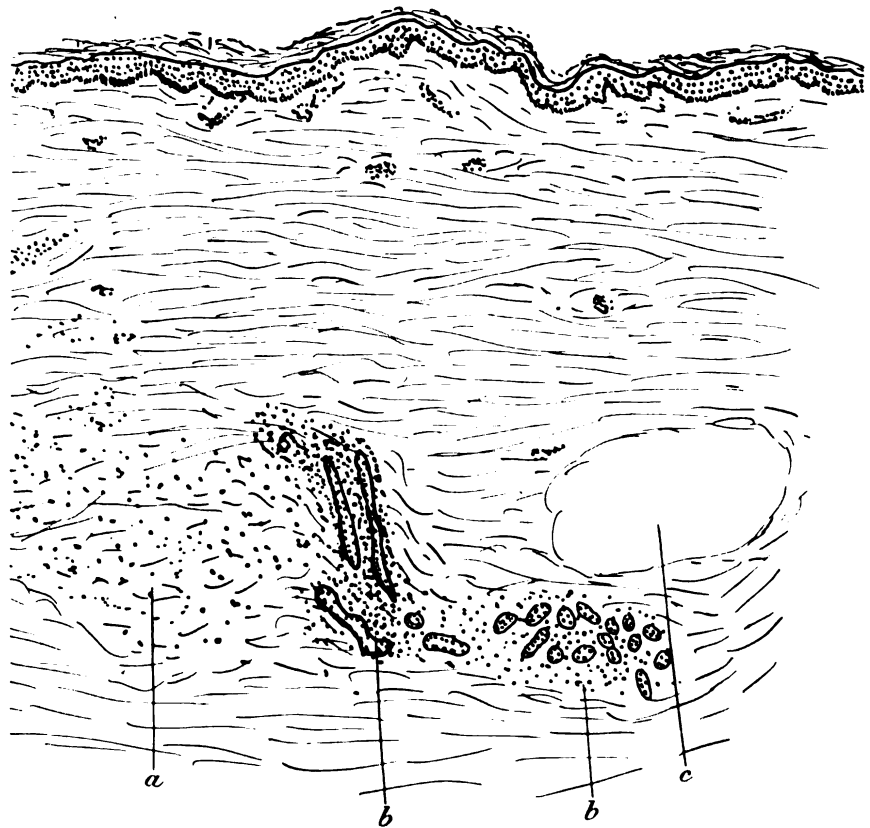


FIG. 12. (Drawn with camera lucida.)

Professor Jadassohn's case (Mme. X). (Leitz objective 3; ocular 2.)

- a Collagen and elastin broken up with diffuse cell infiltration.
- b Sweat-coils and ducts with infiltration.
- c Large blood-vessel cut obliquely.

Section lent by Professor Jadassohn.

XXXIII. CASE 2.—Girl, aged 4. Disease dates from the age of 1, commencing on the left hand with a patch which gradually enlarged. Within the last three months other patches have appeared on the right hand, on the right foot, and on the thighs. Some patches have disappeared spontaneously. The child complains of itching, not confined to the patches, but to a slight degree everywhere, especially about the genitals (the child has worms); she has never scratched the patches; she is a lively child, a little nervous, but of good general health. She had diphtheria some time before the eruption. There is no family disease and no gout. The child is well nourished, with delicate skin and blonde hair; the face, trunk and mucous surfaces are normal. On the right hand, above the metacarpals of the thumb and index, there is a patch nearly the size of a five-franc piece, roughly circular but somewhat irregular, and with the circle broken towards the arm, the centre smooth, of a normal colour without pronounced atrophy. The edge is nearly continuous, of somewhat serpiginous outline, about $\frac{1}{2}$ mm. to 1 mm. wide, of a pale pink colour, without scales, fairly hard, but with a superficial induration and not sensitive; on pressure with a glass this becomes of a pronounced white colour. On the left hand, in the fold between the index and the third finger, there is a circle which crosses the fold in such a way that the circle is continuous only when the fingers are juxtaposed. There is a second circle on the back of the left hand; both these patches are composed of small nodules which form the edge. With this exception they are exactly like those on the right hand. An exactly similar patch, but somewhat larger, is present on the outer edge of the right foot. On the thighs there are some red, smooth stains, sharply circumscribed, not raised or infiltrated.

Fowler's solution and a salicylic acid ointment were prescribed. Four weeks later the patches had grown somewhat larger and a new area had appeared of the size of a sixpence, without central depression, and pale pink, on the third finger of the left hand. No biopsy was obtainable.

Dr. H. G. Adamson's cases.

XXXIV. CASE 1 (communicated).—The patient, W. A., was a boy, aged $3\frac{1}{2}$, who seemed to be in good health, except that he was restless at night, which the mother attributed to thread-worms. The eruption, which was not painful, tender, nor itching, had been noticed for six months, the lesions gradually increasing in size and numbers. Over the buttocks and the backs of the thighs there were about fifteen lesions, some in the form of flat, disc-like nodules of the size of a split pea and somewhat larger; others were well-marked rings of the size of a threepenny-piece to that of a sixpence, the ring itself being formed by a raised, white, firm, $\frac{1}{2}$ in. wide ridge, surrounding a pink centre on a level with the skin surface, and having a narrow pink areola. In some of the rings the ridge was apparently made up of a string of closely set nodules. On passing the finger over the lesion the firm, raised, circular ridge could be felt distinctly, like a ring let into

the skin. There was one ring on the front of the right leg below the knee. There had been no history of rheumatic fever nor any evidence of tuberculosis.

XXXV. CASE 2 (communicated).—G. C., aged 2½. October 29, 1907. North-Eastern Hospital for Children. "Lumps" noticed on elbows and "rings" on buttocks, one month. At the back of the right elbow there are two circular ($\frac{1}{2}$ in. across), disc-like swellings in the skin. They are raised above the surface. When pinched up they feel hard and like a corn in the skin. The skin over them is dusky red. There is one similar patch on the left elbow. On the buttocks there are several ring-like lesions, one on the right buttock and three on the left. They appear as pale lilac rings, slightly raised, with enclosed central part somewhat darker in tint. On pinching up these rings they are found to be firm discs like the others on the arms, and on passing the finger over the lesion the raised margin and central depression can be easily felt. The case was lost sight of at this stage.

XXXVI. CASE 3 (*British Journal of Dermatology*, June, 1908.) (Fig. 13 from photograph by Dr. Adamson.)—"The patient was a printer, aged 17. Five months ago "small red lumps" appeared upon the backs of the fingers and gradually increased in size. When he first came under observation one month ago there were present on the dorsal surfaces of the fingers of both hands raised, firm, dusky red, nodulated, disc-like areas of from $\frac{1}{2}$ in. to 1 in. in diameter, and elevated about $\frac{1}{8}$ in. to $\frac{3}{16}$ in. All the fingers of each hand were involved; in some the dorsal aspect of one phalanx, in others of two phalanges, and in the case of the first finger of the left hand the lesion extended over the middle joint. On close inspection, and particularly on palpation of the raised disc-like areas, it was evident that they were made up of closely set pea-sized nodules; but it was only on careful examination that this feature could be made out, for the individual nodules were close together and their margins were ill defined. In some of the patches there was a tendency to ring formation, owing to the arrangement of the nodules towards the margin of the patch. The hands were cold and of a dusky hue. There were, in addition, a few isolated pea-sized dusky red nodules on the backs of the hands. One of these was excised, and within a fortnight the whole of the lesions had almost disappeared. It was curious that a similarly rapid disappearance of the lesions had occurred in a case of "ringed eruption" recorded by Dr. Graham Little after a biopsy. The exhibitor regarded the case as belonging to the group of cases variously described as ringed eruption (Colcott Fox), granuloma annulare (Crocker), and lichen annularis (Galloway). A section of one of the lesions from the back of the hand showed some widening of the prickle-cell layer and of the horny layer of the epidermis (possibly due to the fact that the section had been cut obliquely). In the corium the fibrous connective tissue was normal, but in it there were numerous circumscribed collections of mononuclear round-cells around the blood-vessels and a large mass of the same type of cells around the sweat-glands. There were no young connective tissue cells, epithelioid cells, plasma-cells, nor

polynuclear leucocytes. The absence of young connective tissue cells described in other cases was probably due to the fact that the lesion excised was at a very early stage. The clinical features and the histological findings suggested a toxic rather than a microbial origin." (Fig. 14 from a drawing by Dr. Adamson.)

XXXVII. Galewsky's case ("Iconographia Dermatologica," Fasciculus iii., with coloured plate).

The patient, seen in autumn, 1904, was a female servant, aged 26, and had had the condition for several months, during which she had been treated



FIG. 13.

C. D., aged 17. April 24, 1908. O.P. No. 1,006. St. Bartholomew's.
"Ringed eruption"—granuloma annulare (?)—erythema elevatum diutinum (?).

by a general practitioner without success. The eruption had commenced with small round red spots, which by degrees developed into nodules, and these again into rings. When seen by the author there were small lentil-sized spots on the forearm and two rather large ring-shaped patches on the

right index finger. The "spots" on the forearm were a vivid red at the edge, and in the middle of the papule of the colour and sheen of ivory. The two ring-shaped patches on the right index formed half-circular rings, which were open on one side, indolent, and of a hard, keloid-like consistence. From this red infiltration the ivory white, shiny, hard, raised, keloid-like edge stood

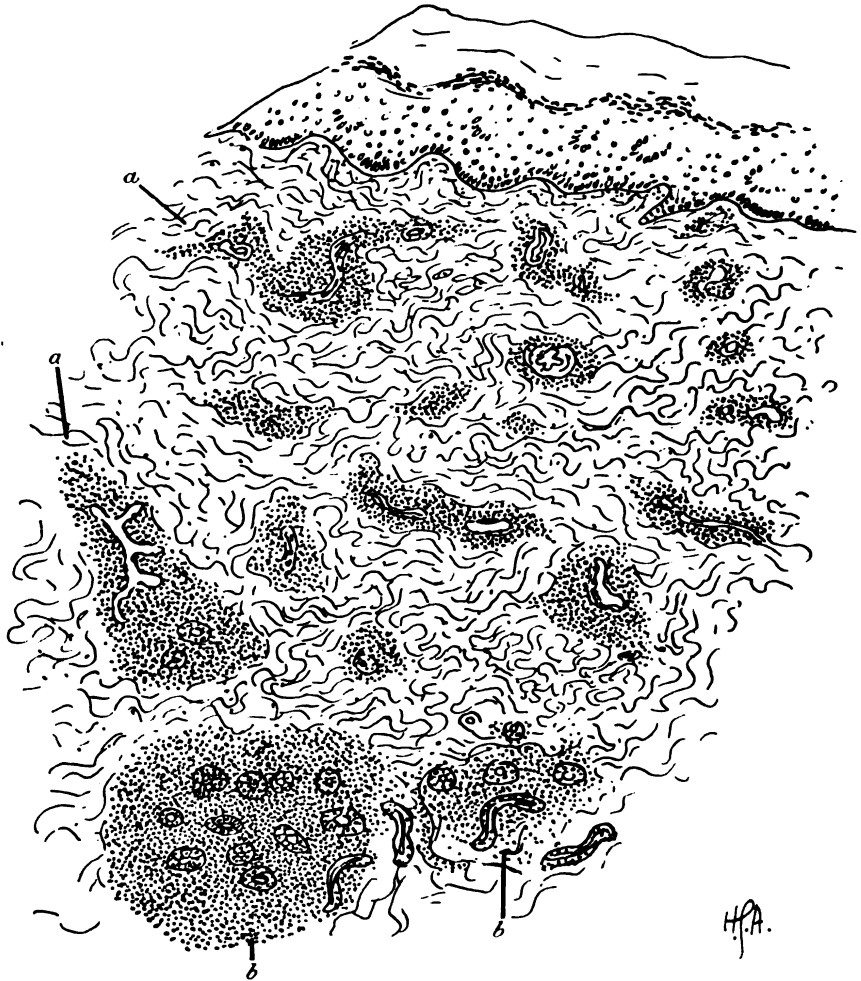


FIG. 14.

- a a* Blood-vessels surrounded by masses of mononuclear round-cells.
b b Collections of similar cells around sweat-glands.

out conspicuously. These swellings were comparatively superficially placed and could be easily moved over the underlying tissues. The central portion of the crescents seemed quite normal, showing at the most a slight atrophic

shininess. The condition disappeared slowly under treatment with arsenic (Fowler's solution) and local application of tar-lotion and plaster without any pigmentation. In July, 1905, the patient came again with a recurrence of the affection and remained under treatment for six months. The small reddish nodules with waxy, ivory-like surface appeared on the forearm, and on the right index thin half circles, exactly similar to the earlier lesions. The patient did not react to tuberculin, and showed no symptoms of tuberculosis. The lesions were treated with salicylic soap and thiosinamine plaster, and the nodules gradually and slowly disappeared, with no other trace save slight whitish atrophic patches.

Microscopical examination showed a normal epidermis, with no changes in the sweat- or sebaceous-glands. There was a diffuse infiltration of cells in the cutis which appeared to be fixed connective tissue cells, with very few mast-cells, and in one preparation some foreign-body giant-cells. This cell-infiltration was in the pars reticularis, the papillary body and the subcutaneous connective tissue being entirely free. In the peripheral part of the tumour there were vascular connective tissue strands, between which round-cell infiltration was seen in some places. There were no obvious changes in the connective tissues or elastic fibres; in the central part the nuclei did not stain, and in the midst of the infiltrated patches there was necrosis.

XXXVIII. Dr. Dawson's case (from notes taken by the present writer at the meeting), Dermatological Section, March 19, 1908.

Male, aged about 22. In good general health. No tuberculous history. On left hand, in the web of the fingers of the middle and index, and the back of the hand in contiguity, there were some few circinate lesions, $\frac{1}{2}$ in. wide, made up of whitish, firm papules forming incomplete rings; very little elevated above the general level and apparently umbilicated in the centre in some instances. On the distal phalanx of the index of the same hand there was a single, whitish, raised nodule of more recent development, with vivid red areola. The patient said that *all* the lesions commenced in this manner. They were entirely painless, and the disease persisted for seven years. No other eruption had been present at any time. "Microscopic examination disclosed swelling of the cells of the stratum mucosum, and marked enlargement of the sweat-glands and ducts" (note by Dr. Dawson).

XXXIX. Dr. J. M. H. MacLeod's case (from rough notes communicated by Dr. MacLeod).

The patient was a man, aged 43. He was seen first in January, 1907, with a ringed and nodular eruption apparently restricted to the back of the left hand. The lesions had commenced fourteen days previously and had gradually increased by peripheral extension. Dr. MacLeod made the diagnosis of *granuloma annulare*. He was put on pot. iod. internally, and mercurial ointment, and the lesion disappeared in about fourteen days. The rings were yellowish pink

in appearance. The mucosa was unaffected. The patient came again exactly a year later with lesions similar to those described but more numerous, on the back of both hands, from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. in size. They were pinkish in colour, rather more rounded on the top than lichen planus, and angular in outline. The circular lesions were due to peripheral extension. There was no itching and no affection of mucosa. The lesion felt hard, like lichen planus, and lichen planus annularis was suggested as a diagnosis. He was put on mist. gent. acid.



FIG. 15.

Dr. MacLeod's case.

as he complained of indigestion ; no local treatment was adopted and the lesions disappeared a week later. No biopsy was obtainable.

[The appearance of the lesions, as shown in the photograph (fig. 15), and the absence of chronicity seem rather to confirm the later diagnosis of lichen planus.—E. G. L.]

Dr. Darier has kindly sent me notes of some very interesting cases of an uncertain type, in two of which he regarded the diagnosis of "granuloma annulare" as probable.

XL. CASE 1.—A woman, the subject of diabetes and syphilis, with a crescentic group of nodules on the thigh. Treatment resulted in mitigation of the diabetes, but persistence of the nodules. No biopsy was obtained.

XLI. CASE 2.—A woman, also the subject of diabetes, with crescentic-shaped group of nodules on the hip. These also appear to have persisted.

The association of diabetes recorded in both these cases is very unusual and not paralleled by any other that I have collected.

In three other cases of eruption in the form of large raised rings, covering very extensive areas of the body, Darier's diagnosis was that of "erythema diutinum figuratum." The biopsy in two of these showed appearances more like those of seborrhoic eczema.

XLII. Mention has been made of a case of Hyde, Montgomery and Ormsby, referred to by Dr. Hyde (p. 119). Since this communication I have been favoured with a photograph of the case (fig. 16) and a section of the skin prepared by Dr. Ormsby. The case was regarded clinically (*vide* Dr. Hyde's note) as granuloma annulare; histologically it appeared to be a keloid. This keloid-like stage has been described in the histology of the case reported as erythema elevatum diutinum (Radcliffe Crocker and Campbell Williams), and was notable in a case of my own in an old lesion, although a recent lesion from the same case showed the features which seem characteristic of granuloma annulare (*vide* Case XLIX.). I am therefore inclined to think that the clinical diagnosis made by Dr. Hyde and Dr. Montgomery is not incompatible with the histological aspect revealed by this section, and I tentatively include this case in my list (*compare with* Cases 27 and 49, synopsis).

XLIII.—Dr. Colcott Fox has given me the following notes of a recent private case (fig. 17) of his in a woman, aged about 35, with nodules and rings made up of nodules, which had persisted for many years and were situated on the back of the hand. The largest ring was of the size of a shilling, and was composed of discrete, white, shiny nodules set like pearls in a brooch, in a circle. Isolated white nodules were also present on the back of the hand, and over the left index finger at the knuckle there was a lumpy flat swelling. The hands were cyanotic, with chilblain circulation. No subjective symptoms were complained of. The case was lost sight of.

MY OWN SERIES OF CASES.

XLIV. CASE 1 (*British Journal of Dermatology*, 1905, p. 16).—H. M., female, aged 6, sent to St. Mary's Hospital by the late Dr. John Garrett, of Acton, and shown at the Dermatological Society of London (December 14, 1904). The diagnosis then adopted was that of a "ringed eruption," of the same type as Colcott Fox's cases (1895), Galloway's case (1899), and Pringle's case (XVI.), shown at the same

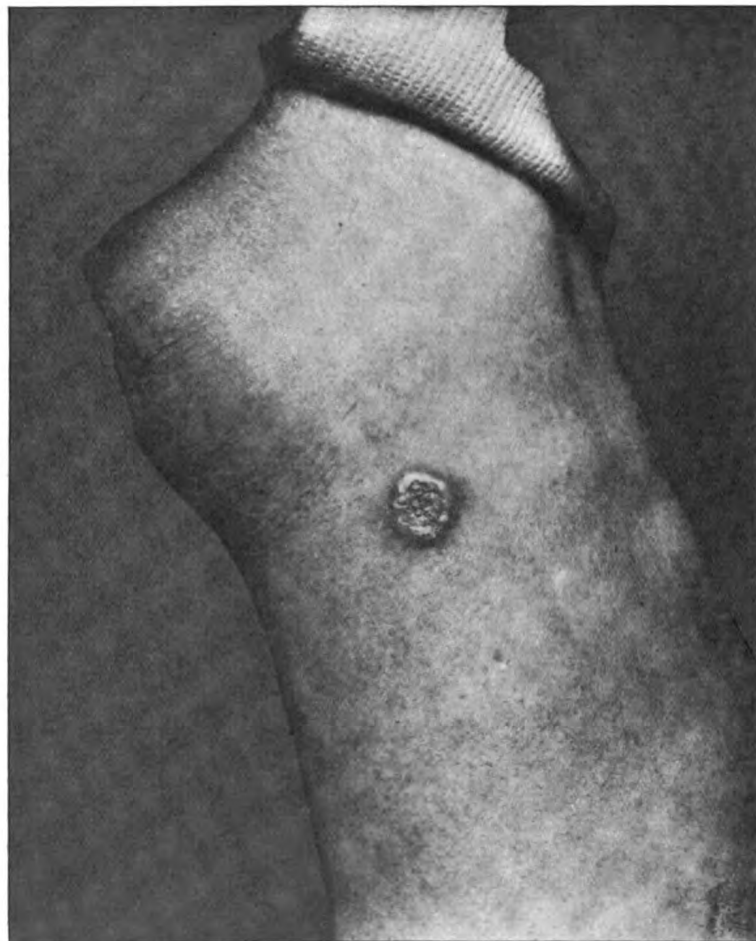


FIG. 16.

(From photograph lent by Dr. Hyde, Dr. Montgomery, and Dr. Ormsby.)
Case clinically regarded as granuloma annulare, histologically as keloid.

(Section lent by Dr. Ormsby.)

meeting. Its identity with granuloma annulare, as described by Crocker, was disputed by many, adopted by some. The patient when seen at the meeting had two lesions: a ringed group of papules which formed a continuous edge, at first white in colour, afterwards becoming red, $\frac{1}{8}$ in. broad and raised about $\frac{1}{16}$ in. from the level of the skin. The ring was about the size of a sixpenny-piece, quite circular, and enclosing an area of skin which was redder than normal, rather more furrowed than usual, but without signs of atrophy; there was another quite similar lesion, except that it was crescentic and not an entire circle, on the skin covering the right internal malleolus. Neither lesion was attended by any subjective symptoms whatever, and these two lesions constituted



FIG. 17.

Dr. Colecott Fox's case. (?) Granuloma annulare (Crocker) with cyanotic extremities.

the whole eruption as seen by the writer of this paper; but Dr. Garrett had recorded an attack of "urticaria," a transient eruption lasting fourteen days and preceding the appearance of rings by some time, not definitely stated, shortly before these were noted.

The ringed lesions had persisted for four months before the case was brought to St. Mary's, and lasted about three months after this date; they finally disappeared, leaving no scar or sign.

The child sweated freely, and her hands and feet were usually clammy with perspiration; the disease had commenced in August in the height of a hot summer. The family history was not obtained. The

patient was a small, delicate-looking child, but without any definite illness.

Histology (fig. 18).—There was slight thickening of the stratum corneum, and the granular layer was two or three cells thick. There were large accumulations of cells, almost like the focal accumulation of tubercle, round the sweat-coils in the deeper parts of the corium and extending right into the hypoderm. The fat-zone did not come into the section except in a fragmentary manner, and no definite data as to its condition were possible. The elastin was normal throughout the section, but it was absent in the cell-masses. In the central part of some of

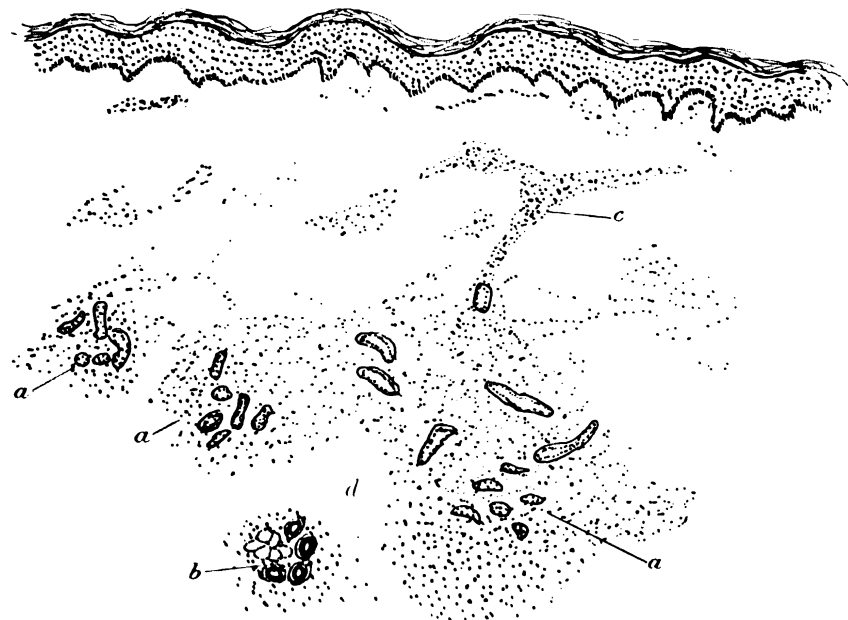


FIG. 18. (Drawn with camera lucida.)

H. M. (Leitz objective 3; ocular 2.)

- a Sweat-coils and ducts with infiltration.
- b Thickened vessels in fat lobules with infiltration.
- c Infiltration round vessel.
- d Area of destruction of tissue.

Stained with polychrome methylene blue.

these cell-masses an appearance of destruction, or at least of feeble staining of the mass, was noted. The cells consisted chiefly of connective tissue corpuscles, with mononuclear and epithelioid cells. In the hypoderm the larger vessels appeared thickened and were surrounded in places with cells of the type described.

XLV. CASE 2 (unpublished).—East London Hospital for Children. E. W., male, aged about 3, came with a single lesion, a circinate patch on the front of the left wrist. The ring was oval, with a firm, almost cartilaginous edge, whiter than the surrounding skin, and raised about $\frac{1}{16}$ in. from its level. When seen the patch was of the size of a sixpenny-piece, and was said to be enlarging. It had persisted for three months. The central portion of skin was pinker than normal, a little wrinkled, but with no definite atrophy. There were no subjective symptoms whatever in connection with it. The child seemed fairly well; he had some remains of impetigo on the buttocks.

A request to perform a biopsy on this case frightened the mother to such a degree that the child was not seen again, and no answer was returned to letters inviting her to attend the hospital, so that the subsequent history was lost.

XLVI. CASE 3.—St. Mary's Hospital. A young girl, E. P., aged 16, shown at the Dermatological Society of London in April, 1906. The patient had come to St. Mary's Hospital a week previously to being shown with a ringed and papular eruption on the dorsum and side of the right hand. The papules were somewhat itchy, white at their commencement, becoming red later, and forming ring-shaped patches with rather indefinite outlines. An ointment of glycerine of subacetate of lead applied on lint with the part bandaged over had reduced the lesion to vanishing point at the time of showing the case. The nature of this case is perhaps doubtful; the localization and clinical aspect of the lesions strongly suggested the diagnosis of granuloma annulare; the rapid involution of the lesion is paralleled by an experience in the case of W. S. (*see* below), in whom a bandage applied after a biopsy had produced the almost complete disappearance of the nodules included in the bandage within a week, and in the case of Adamson recorded above.

XLVII. CASE 4.—St. Mary's Hospital. W. S., aged 42. He is a "handy man" at a little private hotel, and is a small, thin, anæmic-looking person, but with no definite illness. He is probably overworked and underfed. He perspires extremely freely and easily, and his skin is usually clammy or wet. Three types of lesion are demonstrable: (1) An early nodule, usually waxy white and almost translucent, which becomes redder later; (2) rings and crescentic-shaped groups of nodules, these being discrete or running together to form a continuous edge, the central portion of the skin so enclosed being dusky in colour, smooth, and showing no signs of scarring; (3) doughy, circumscribed, violaceous,

pad-like patches with uniform elevation and roughly circinate outline, imparting a feeling of irregularity of surface, comparable to the surface of a Lilliputian worn flock-mattress. These patches are possibly made up of deep-seated, confluent nodules, but there is no ringed edge or depressed centre, and individual papules cannot be made out.

The present distribution of the lesions, which have continued to come out from time to time during his attendance of many months at St. Mary's Hospital, is as follows: The disease is said to have commenced on the front of both wrists three years ago, and the lesions here are whitish warty nodules, very numerous, and tending to form roughly circinate groups, the area covered being about 2 in. by $2\frac{1}{2}$ in. Near the olecranon process there is another definitely circinate patch of a fortnight's duration. There is another circinate patch at the base of the dorsal surface of the index of the left hand, about $\frac{1}{2}$ in. to 1 in. in diameter; there are two patches on the external (radial) surface of this hand near the base of the fifth finger. There is a similar circinate, doughy patch on the dorsal surface of the right hand near the base of the fifth finger, and another patch on the radial edge of the proximal phalanx of the right ring finger, circinate patches on the dorsal surface of the middle phalanx of the middle finger and of the index. The patches on the fingers are said to have been of recent origin, having appeared within the last nine months. There was a small patch on the extensor surface of the left forearm (excised for histological examination). There is a large circinate patch $1\frac{1}{2}$ in. across over the right patella. The colour of the enclosed ring is a pale to a bluish pink; the surface is perhaps a little wrinkled or striated, but not shiny or presenting signs of atrophy. The man sweats extremely freely, so that he has to change his garments sometimes three times a day. He is anæmic, almost cachectic-looking, and thin, but with no definitely tuberculous symptoms. Fresh papules appeared in the case from time to time during some months that he was under observation; then a small grouped patch came out on front of the right elbow. These new papules were pale, almost colourless, and of the size of a split pea. There were no buccal lesions and no symptoms pointing to lichen planus. The disease slowly disappeared with local treatment (salicylic acid, zinc ointment and carbolic acid).

The patient was shown at the Dermatological Society of London (*British Journal of Dermatology*, 1906, p. 117), and the diagnosis of granuloma annulare was generally accepted.

Histology (fig. 19).—The epidermis is not in any way altered; there is no acanthosis; the granular layer is about two cells thick, the rete normal. The main changes affect the deeper layers of the corium and hypoderm. There is a dense cell-infiltration in the zone of the fat-lobules, and some of these have undergone fibrotic organization, spaces corresponding to fat-cells being left here and there in the organized mass. The sweat-glands and ducts, the hair-shaft,

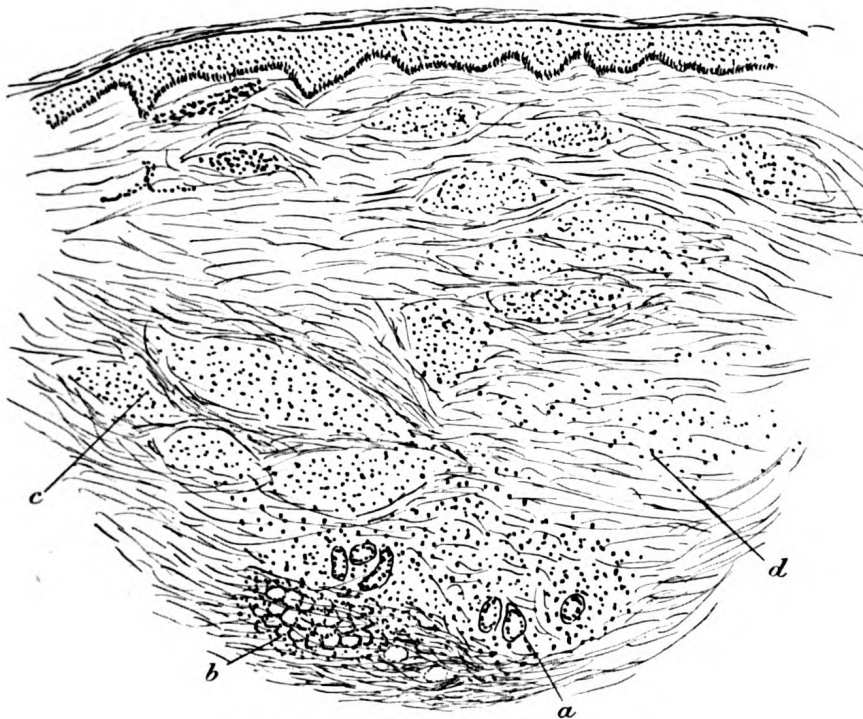


FIG. 19. (Drawn with camera lucida.)

W. S. (Leitz objective 3; ocular 2.)

- a Sweat-coils surrounded by cells.
- b Fat lobules infiltrated by cells.
- c Clumps of cells, walled in by collagen.
- d Diffuse infiltration with breaking up of collagen.

Section stained with von Gieson-Hansen.

and the vessels are surrounded by dense cell-infiltration. The vessels, especially in the hypoderm, are thickened, and in some cases their lumen obliterated. In the lower parts of the corium the collagen and elastin bundles are disintegrated, the cellular mass being interspersed by

fragments of connective and elastic tissue. In other parts of the section, especially in the upper zones, the cell-masses are, as it were, encapsuled by collagen and elastin, nodular foci being thus formed. In many cases it is possible to identify portions of sweat-ducts or vessels in the nodule, which seems thus to serve as a centre for the infiltration.

The cell-infiltration consists of large mononuclear cells, staining deeply with nuclear stains; and of connective tissue corpuscles, staining less deeply; and large epithelioid cells. Mast-cells do not appear especially numerous, and no giant-cells or typical tuberculous "nodules" are discernible. No micro-organisms were seen in the few specimens specially stained for these.

XLVIII. CASE 5.—East London Hospital for Children. E. C., female, aged 4, sent to the Children's Hospital, Shadwell, by Dr. Fiddes, of Forest Gate. This case was shown at the meeting of the Dermatological Section of the Royal Society of Medicine (February 20, 1908), and was generally accepted as an instance of "lichen annularis."¹

The eruption consisted of two lesions, one a group of pearly whitish nodules, arranged in a complete circle $\frac{1}{2}$ in. by $\frac{3}{4}$ in. with a pink areola and situated below the left buttock, in the sulcus between the buttock and thigh; the other was a single nodule in a corresponding position on the right buttock, the size of a pea, deep seated and bluish in colour. From this nodule the sections to be described were obtained. The circinate lesion had persisted for about three months. It was best seen when the skin on which it was placed was stretched, when the nodules stood out as discrete white swellings $\frac{1}{16}$ in. in diameter and rather less than that in height. The enclosed skin was a darker colour than normal—slightly violaceous and wrinkled. Both lesions were quite painless, and the child was unconscious of their presence. No other had appeared at any time.

The patient herself was a fine healthy girl, fat, rosy, and well in every way; but the family history was markedly tuberculous, a brother of the child being at present in the Children's Hospital with tuberculous knee, and one paternal uncle having died of phthisis when aged 34.

The position of this eruption on the buttocks was paralleled by Fox's and Adamson's cases. The single remaining lesion, the ring of nodules, had quite disappeared five months after she first came, the treatment being salicylic acid plasters (10 per cent.), changed

¹ Vide discussion *Brit. Journ. Derm.*, March, 1908.

three weeks later, because of the pain they caused, to salicylic acid ointment with 5 gr. of ichthyol to the ounce.

Histology (fig. 20).—The isolated nodule from the left buttock was excised, hardened in alcohol and cut in paraffin. The section showed a normal epidermis with no thickening of the rete. In the corium there were clumps of cells aggregated together, and walled in by connective tissue; and rows of cells running up apparently from the deeper to the superficial skin along the line of sweat-ducts, vessels and hair shafts. These cell-collections were composed of mononuclears, connective tissue cells, a few epithelioid cells, and rather numerous mast-cells. The elastic fibres were absent in the cell-masses. There was a nodular area of necrosis in the connective tissue in the deepest part of the corium.

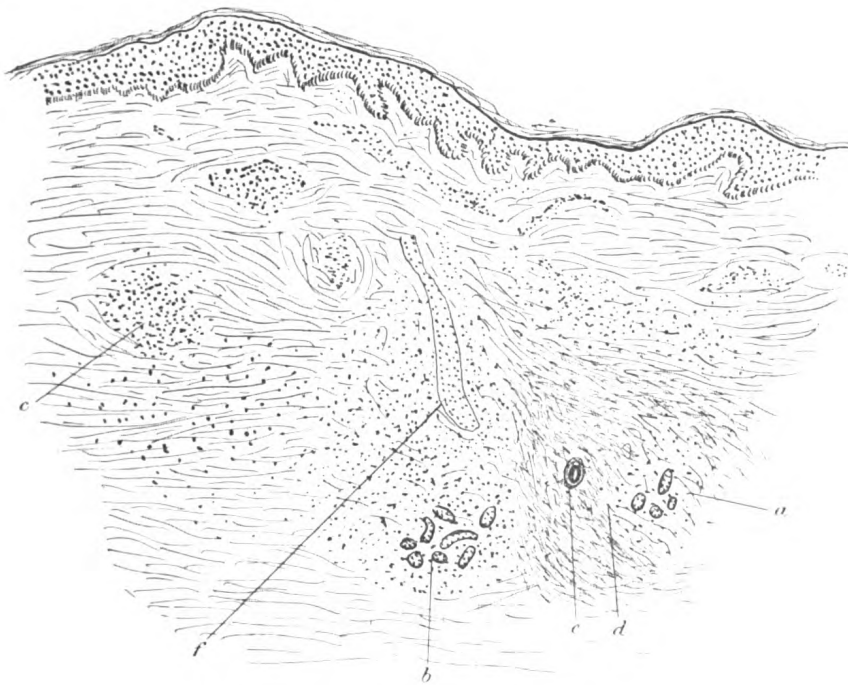


FIG. 20. (Drawn with camera lucida.

E. C. (Leitz objective 3; ocular 2.)

- a Sweat-coils, surrounded by cells, and lying in broken-up collagen.
- b Sweat-coils, centre of a nodule.
- c Clumps of cells walled in by collagen.
- d Area of necrosis.
- e Thickened blood-vessel.

Section stained with von Gieson-Hansen.

XLIX. CASE 6.—St. Mary's Hospital. A. C., female, aged 18. A florid-complexioned girl, with the "faux embonpoint" of the tuberculous, came to St. Mary's Hospital on January 8, 1908, with a number of small, deep-seated nodules, about to be described. The family history was unimportant, and she herself complained of no illness, but she was detected subsequently by Dr. Sidney Phillips, who kindly examined her for me, to be suffering from early pulmonary tuberculosis at one apex. She is a Londoner, and a laundress by occupation.

Description of Lesions.—These are of three types: (1) An early white papule, like boiled sago-grain; (2) A bluish, deep-seated nodule, firm to the touch, and in the substance of the skin and movable with it; (3) Dough-like, and in some places keloid-like, masses, probably composed of individual nodules, forming raised, infiltrated patches on the fingers, the arm, and the breast. In some cases, *e.g.*, at the wrist, there is an incomplete ring in the shape of an umbilicated large nodule, and some three or four of these are grouped in an irregular crescent. With this exception the lesions are for the most part isolated. All the lesions are painless, not tender on pressure, and with no subjective symptoms associated with them.

Distribution: Right Hand.—There is an infiltrated patch, composed apparently of several nodules, on the proximal phalanx of the little finger. This patch at first was a doughy infiltration; it resolved itself later into separate nodules which became umbilicated; there is also a circinate patch with a central depression and surrounded by a red areola, the edge raised, and of a diameter of $\frac{1}{4}$ in., on the dorsal surface of the right hand $\frac{1}{2}$ in. from the metacarpo-phalangeal joint. On the ulnar edge of the right forearm, 1 in. above the ulnar prominence, there is a group of five circinate lesions with a central depression, puckered but without actual ulceration. The foci form a crescent of about 1 in. in diameter, each lesion being about $\frac{1}{4}$ in. across. On the middle of the forearm, extensor aspect, there is a single depressed pitted scar, about $\frac{1}{4}$ in. in diameter, with some blue staining and reddening around it, the remains of a previous lesion. There is a similar depressed reddened scar on the inner aspect of the forearm, near the olecranon process. On the extensor aspect of the upper arm there was a deep-seated bluish recent nodule, which was excised for examination. The wound healed with keloid-like scar. On the inner aspect of the right upper arm there was a prominent purplish blue, deep-seated, keloid-like swelling, which was also excised for examination; this was one of the oldest lesions; two

quite similar lesions of the same date were found on the skin just above the prominence of the right breast. There is a white nodule surrounded by a vivid violaceous areola on the point of the chin. There is an isolated, deep-seated, blue nodule on the left side of the back, about 1 in. below and internal to the angle of the scapula.

Left Hand.—On the proximal phalanx of the middle finger there is a deep-seated hard nodule which can be felt easily in the substance of the skin, but not readily seen. There are two bluish nodules with depressed centres at the base of index (dorsal aspect). There is a pitted scar on the radial edge of the forearm 2 in. below the point of the elbow. There is a deep-seated blue nodule 1 in. below the olecranon process and another on the point of the shoulder above the vaccination marks.

Right Foot.—There is a nodule with central atrophy at the base of the little toe; near this, on the dorsal aspect of the foot, are four grouped, white, sago-like nodules, all of recent development. There is a deep-seated blue nodule, $\frac{1}{2}$ in. external to the border of the tendo Achillis, about 2 in. above the level of the malleolus.

Left Foot.—There is a single nodule on the dorsum of the foot, at the base of the little toe.

There is a patch of infiltration, bluish red, with two small elevations, with pitted centre, and one unpitted white nodule over the tibioastragaloid articulation, front aspect. There is a group of nodules on an infiltrated patch over the prominence of the tendo Achillis, 1 in. above its insertion. The abdomen is free. There is a group of pigmented patches (remains of old nodules?) over the sacrum. There is a bluish nodule and a scar, the remains of an older lesion, on the posterior surface of the right thigh, at the level of the gluteal fold. There is a small blue nodule in the middle of the right buttock and another close to the internatal fold. There is a blue nodule in the middle of the left buttock. There are one or two small depressed scars on the forehead, and one on the left cheek. The scalp appears quite free. There are no glandular enlargements; no hyperidrosis; no night sweating.

While under observation several of the nodules involuted, leaving shallow pitted scars in many instances; in others no trace.

The patient was tested with a 0.5 per cent. solution of Calmette's tuberculin dropped into the left eye (the conjunctiva). A doubtful reaction followed, the conjunctiva being very slightly reddened. Ten days later a 1 per cent. solution of Calmette's tuberculin was used, producing a violent conjunctivitis within twelve hours. The opsonic index had been estimated on several occasions (*see table on next page*).

Before admission to St. Mary's Hospital	...	Some time in January, 1908	...	1·02
After admission	...	February 5, 1908	...	0·97
" "	...	" 7, "	...	1·45
Ten minutes after "Calmette"	...	" 10, "	...	0·87
Six hours after "Calmette"	...	" 10, "	...	0·84
Twenty-four hours after "Calmette"	...	" 11, "	...	1·03
" "	" "	" 12, "	...	1·15
" "	" "	" 13, "	...	1·03
" "	" "	" 14, "	...	0·91

I am much indebted to Dr. Colebrook for these estimations.

A recent nodule from the back was excised and the tissue introduced into a guinea-pig, under the direction of Sir A. E. Wright, by his assistant, Dr. A. Fleming. The test animal was killed three months later and showed no symptoms of tuberculosis.

Histology.—Two nodules were excised in this case. The first, which had persisted for five months, was situated upon the upper arm, and was a prominent purplish-blue keloid-like tumour. This had never ulcerated, and similar lesions had, according to the patient, left the pitted scars which were to be seen on the arm and elsewhere. The section showed the whole of the central part of the tumour, from the epidermis to the hypoderm, occupied by thin strands of faintly staining fibres, in horizontal wavy bands, contrasting with the normally thick and normally stained connective tissue at the periphery of the swelling. Interspersed between these fibres were very numerous groups of cells encapsuled by the connective tissue. Elastin was entirely absent in this part of the tumour, although present at the periphery. The epidermal down-growths were also conspicuously absent, the line of junction of corium and epidermis being, as in scar tissue and keloid, an unbroken horizontal plane, without papillary bodies or hair follicles. The resemblances of this section to keloid make me inclined to think that in certain stages of granuloma annulare the clinical and histological features of keloid may be closely imitated. I am confirmed in this view by the experience of Dr. Nevins-Hyde, Dr. Montgomery, and Dr. Ormsby with a case which is alluded to in the description of Dr. Montgomery's case of ringed eruption, recorded elsewhere in this paper. These observers met with a case which, clinically, they would have regarded as an instance of "granuloma annulare" had not the histology been that of "circinate keloid." The photograph of this case, kindly sent to me by these good friends of mine, together with a section of the case by Dr. Ormsby, recall very closely the appearances seen in the nodule I am here describing. Further confirmation is given by the case of

Quinquaud, the wax model of which is described in the St. Louis Museum Catalogue as "fibromes fasciculés," a description which would aptly fit the histological characters of both the present case and that of Dr. Hyde, Dr. Montgomery, and Dr. Ormsby. The frequent mention, in the synopsis of cases, of cicatricial and atrophic clinical appearances in certain stages of the lesion of granuloma annulare supports the suggestion I would make that keloid-like stages are met with in the involution of the nodule of granuloma annulare.

In the second nodule from the case of A. C., which was a quite recent lesion, also from the arm, but certainly not more than one week old at the time of excision, the appearances are much more in conformity with the other cases I have recorded, and are, indeed, especially like the histological features of the case of W. S., of my series, and the case of Brocq, sections of which are described in detail under the description of these cases. These three cases, in fact, form a series which has materially influenced me in the view I now hold that lichen annularis and granuloma annulare are one disease, and with strong associations with tuberculosis. My argument is, briefly, that W. S. was clinically an undoubted case of granuloma annulare as it appears in the adult; Brocq's case apparently as undoubtedly a case of lichen annularis in the child; and A. C., though clinically a dubious instance of either, histologically is identical; and A. C. showed definite tuberculous symptoms.

To resume the description of the second (recent) nodule in this case (fig. 21):—

The stratum corneum and granular layer are normal; there are small accumulations of cells surrounded by normal connective and elastic tissue in the cutis in its middle part, and more deeply there are areas where the elastic and fibrous tissue is slightly broken up and infiltrated with cells. This infiltration increases in severity in the deeper layers of the skin, until in the hypoderm the whole fatty zone is impregnated with cells, and there is here definite sclerosis and fibrotic change of the fat-lobules, very clearly seen in the sections stained with von Gieson-Hansen.

The cell-infiltrations in the corium, which are centred round hair-shafts, vessels and sweat-ducts, are seen to consist chiefly of large mononuclears with some polynuclears, of connective tissue corpuscles and epithelioid cells, and in this case a considerable number of mast-cells. Some multinuclear giant-cells without central caseation were seen in one section.

GENERAL REMARKS.

Initial Lesion and Terminology.—In the synopsis of all the cases of which I have been able to find record or obtain information I have set apart a special column describing the initial lesion; it will be seen that in the overwhelming majority of cases this is a nodule; Brocq's name for the disease, "néoplasie nodulaire et circonscrite," seems to me to be preferable to any of the others suggested, although the term "new growth" may not be the happiest to describe

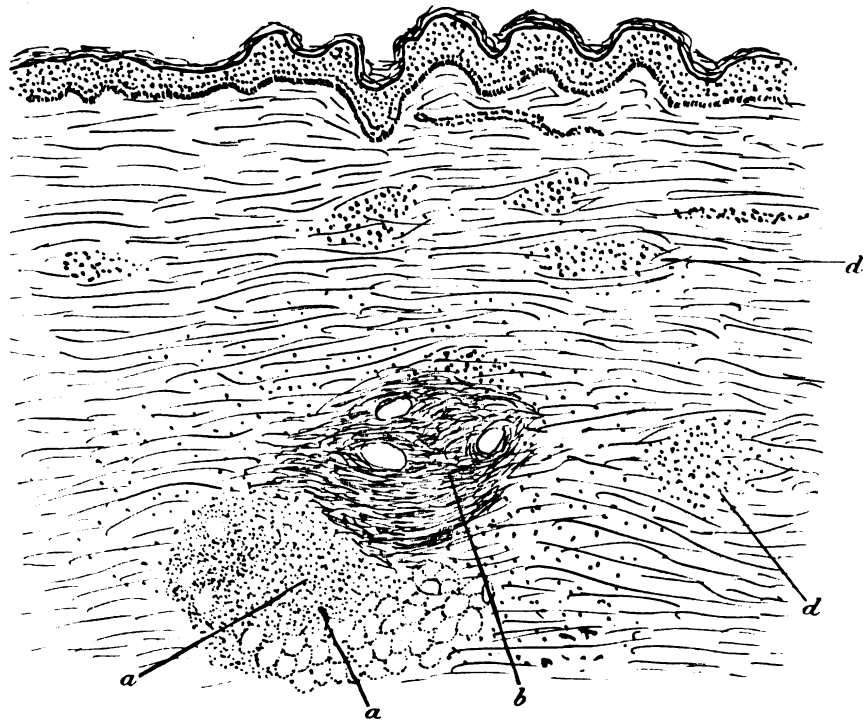


FIG. 21. (Drawn with camera lucida.)

A. C. Recent nodule. (Leitz objective 3; ocular 2.)

- a* Dense infiltration with early fibrosis of fat.
- b* Fibrosis with large spaces.
- d* Clump of cells surrounded by collagen.

Stained with von Gieson-Hansen.

the histological features. Objection may be taken to all the other names proposed. "Lichen annularis" seems to me to be a particularly unfortunate selection owing to the liability to confuse this disease with lichen planus annularis—with which, in my opinion, it

has no connection whatever; "ringed eruption" is too vague, and does not include the isolated nodule stage which may exist without the ringed arrangement. The same objection is also valid against "granuloma annulare," and the histology is not that of "granuloma"; but largely no doubt owing to Dr. Radcliffe Crocker's selection of this term, it is probable that it will eventually win in the competition for supremacy.

I think it is important to insist rather on the character of the nodule than the perhaps less constant arrangement in rings, which when present makes the disease so striking that this feature has monopolized attention. The nodule, then, in its first inception is a whitish semi-translucent swelling, becoming more visible if the skin is stretched, when it is easily felt as a deep-seated, hard, pea-like body in the skin. Many observers have described the subsequent development of rings as being due to peripheral enlargement of individual nodules with involution in the centre. My own experience would lead me to describe the phenomenon as more often due to fusion of collateral nodules which are grouped in a circinate or crescentic manner; I have seen individual nodules become rings only in one case, which was considered the most doubtful of my series (Case 6). But I have repeatedly seen fresh efflorescences of nodules of equal size and age grouped in rings from the outset, and I believe this to be the sounder explanation of the circinate arrangement. This circinate grouping is common to many diseases in which lesions follow the distribution of vessels in the skin. The nodule, in its earliest stage, is usually *white*, with something of the appearance and rather less than the size of a boiled sago-grain. I would emphasize this early whiteness and semi-translucence, as I believe this feature serves to differentiate it from the lesions of folliclis. (In Case 6 of my series I opposed the latter diagnosis chiefly on this clinical difference as well as on the histology of the lesion.) In Case 4 of my series, a man whom I had under my observation for many months at St. Mary's, it was possible to note the sudden appearance of these white nodules, which later became red or blue and grouped in rings. Inversely, too, in the course of involution of the disease, the rings may become resolved again into nodules, and the ring character quite disappear.

It is a most curious feature of a lesion, which may be destined to persist for months and which perhaps has tuberculous associations, that it may spring into being almost with the suddenness of an

urticarial wheal, and with no subjective symptoms whatever to mark its coming. But Darier's experimental production of typical tubercular nodules in the skin fifteen days after an injection of tubercle bacilli proves that the rapidity of the tubercular process is greater than one would be inclined to suppose from the contemplation of the more ordinary clinical progress of tubercular manifestations. Similarly, the demonstration of the histologically tubercular character of the rash of lichen scrofulosorum resulting from the injection of tuberculin, often within a few hours of that injection, proves that histological tubercle may be of very rapid production.

The nodule is *deeply seated* in the skin, as both clinical and histological evidence shows. In some of the cases the earliest inflammatory collection of cells appeared to surround especially the sweat-coils (Pringle's case, *e.g.*), a point which will be referred to later.

The nodule is usually the earliest lesion, but in some cases the eruption was first seen in the form of a ring, which could generally be made out as consisting of individual nodules, discrete, closely grouped and enclosing a space of skin concerning which the descriptions differ greatly. Usually the colour of this central area is darker than normal, more congested and red; sometimes the skin has been noted to be "atrophic" and even "cicatricial." The size of the ring varies also greatly, from $\frac{1}{2}$ in. in diameter to 2 in. or more. The border is usually about $\frac{1}{16}$ in. in width and about the same in height. A certain degree of erythema immediately surrounding the nodule and the rings has been described, but is not constantly present; the "halo" of redness contrasts with the whiteness of the lesion. The ring may involute unequally so that part of the edge may flatten, leaving the rest unimpaired. The ring is thus often not complete, but crescentic and festooned figures are formed by the grouping of the nodules. The lesions on disappearance may be said to leave, in the majority of cases, no permanent scar or pigmentation.

The distribution of the disease is very specialized. Upon reference to the table it will be seen that the hand is the commonest seat, the dorsum of the fingers and the wrist being especially often occupied. Next in order of frequency come the feet, the ankle, the neck, elbows and knees, and the buttock. The face and the scalp are rarely affected. The number of lesions is usually restricted to quite a few, sometimes to a single instance; but there they may be, exceptionally, an extensive distribution (Cases 32, 47, 49), which never, however, approaches the degree of a general efflorescence.

The course of the eruption is very varied. The longest duration noted in any case was seven years (Dawson). Lesions untreated appear to be extremely indolent and to show little tendency to spontaneous cure, but when treated the most obstinate lesions seem to be dispersed by quite simple means, such as maceration. In one case, after excising a small nodule from a large patch on the wrist, I found a week later, apparently as a result of the bandage applied to the part, that the neighbouring nodules had flattened down almost to vanishing point. Adamson has reported a similar experience. Untreated, the nodules, and the rings made up of nodules, slowly enlarge and apparently persist indefinitely (but *see* Sequeira's and Jadassohn's cases, in which spontaneous involution occurred). Ulceration of the nodules or rings does not appear to occur even where scars have been noted (*compare* with sarcoids of Darier, where ulceration is also absent).

Subjective Sensations.—It has been noted that the lesions of the disease may appear as suddenly as urticaria, and it is somewhat remarkable that with so acute an onset there are usually no subjective symptoms associated with the eruption. The lesions are stated to have itched slightly in a very few instances. With this exception subjective symptoms are absent, and the first intimation that the patient has of his affection is that he sees the nodules or rings.

Incidence of Season, Age and Sex.—In the few cases in which it was possible to ascertain the date of commencement of the eruption, a preponderating number appear to have begun in the summer months, and this is suggestive in view of the involvement of the sweat-glands indicated in the histological examinations of early cases. The age of the patients varied within wide limits, the figures, in the cases where the age of the patient is recorded, being nineteen cases under the age of 12, as against twenty-eight in patients above that age; the oldest age at which it was observed was 52 years, the youngest at 18 months. In twenty-four cases the female, in twenty-three cases the male sex is recorded.

Rarity of the Disease.—I had personally never had a case under my own observation until the latter half of 1904, when Case 1 of my series came to me at St. Mary's Hospital. In the next two months I had seen of my own and others four further examples of the disease, and in the same six months Brocq and Dubreuilh reported their series of cases. A careful examination of the records of the Dermatological Societies of London and of Great Britain shows a singular dearth of such cases since Galloway's report in 1899 up to

1904, and it remains a very rare disease. Hyde and Montgomery, whose general turnover of cases is enormous, have seen only one of this type prior to 1899, and in a quite recent letter inform me that they have seen no other instance of it. The disease, however, is certainly not so rare as is stated, *e.g.*, by Galewski, who could only record four cases. Many new cases are reported in this paper, and others are mentioned which are unreported.

Histological Consideration.—I think it is impossible to avoid the conclusion that in the four cases which I have referred to as Pringle's, Perry's, Galloway's, and my own case of H. M., the disease is the same. All these occurred in children; clinically they were manifestly identical as far as I can testify, who saw them all. They are the type to which Galloway's name of lichen annularis applies. Similarly I think that histologically it is impossible to refuse the conclusion that the three cases of A. C. and W. S., of my series, and Brocq's case, described in the text (Nos. 49, 47, 22), are one disease; and the question to be decided here is whether these two classes can be approximated or identified. A detailed exposition of the histological appearances in each of these groups of cases will be necessary before this question can be decided.

First Group.—In all four cases the epidermis is little, if at all, affected, a very moderate thickening of the stratum corneum, a granular layer which is perhaps a little thicker than normal being all that is seen to note. There is no acanthosis, no thickening of the rete.

In the corium the subpapillary zone is almost normal; in Galloway's case alone of this series is there any degree of infiltration here, and it is obvious that in this case, too, the infiltration becomes more marked and more extensive deeper in the skin, and that the more superficial inflammation is a continuation of that which has taken place in the deeper zones. In all four cases the chief changes, amounting to tumour formation, take place in the zone where corium and hypoderm meet. Here there is an accumulation of cells in the section, which constitutes a microscopic nodule. In these four cases the central part of the nodule round which the cell infiltration is grouped seems to be composed of dilated sweat-coils; but similar groups of cells are also found round the hair-shaft and probably round blood-vessels. In two of the cases (Galloway's and H. M.) there appeared to be areas of degeneration in some of these cell-masses, and elastic and connective tissue fibres were absent from these cell-masses, or if found interspersed between the cells, these fibres were fragmentary. In other parts of the section both elastin

and connective tissue (collagen) were normal. In the other two cases of this series (Perry's and Pringle's) no data were obtainable as to the elastin.

Besides these aggregations of cells in rounded clumps, there were numerous rows of cells ascending from the tumour-mass to the surface, and distributed apparently along the course of sweat-ducts, hair-shafts and vessels. There were less numerous horizontal rows, lying between the fascicles of the connective and elastic fibres, and further a scattered cell-infiltration permeating the connective tissue.

When examined with the higher power the cell-masses, both when lying in clumps and surrounded by connective tissue, and when interspersed in rows between the fibres, appear to be of the same type, and to be composed chiefly of three kinds of cells: (1) A large mononuclear cell, staining vividly with nuclear dyes, larger than a leucocyte, but without the protoplasmic envelope of plasma cells, such protoplasm as is present being like a thin halo with the nucleus in its centre. These are probably the chief constituent of the cell-mass. (2) Numerous spindle-shaped, or oblong, or pear-shaped cells, not staining so deeply as the above, with an elongated nucleus, and indistinguishable from connective tissue corpuscles. (3) A few large faintly stained "epithelioid" cells, interspersed in the cell-mass. Mast-cells appeared unduly numerous in one case (H. M.).

In the case of H. M. and Galloway's case the infiltration descends to the deepest part of the corium and probably implicates the fatty layer, since the section which terminates at this layer is strongly infiltrated right up to the cut margin. The same is true to a less degree in Perry's, and to a still less degree in Pringle's case. The latter seems, indeed, to show the earliest type of inflammation of any of the cases examined.

Second Group of Three Cases.—The epidermis is unaltered, the granular layer, the stratum corneum and the rete being all normal. In the corium, in the upper parts immediately below the epidermis, there are isolated small groups of cells lying between separated connective tissue, and found to be in association with blood-vessels. These groups become far more numerous and larger as one descends into the corium, so that the main changes appear in the middle and lower parts of the cutis. Here the cell-masses come to occupy the greater part of the tumour-formation. The cells are arranged in clumps surrounded by connective and elastic tissue, and in long vertical and horizontal rows, following the course of vessels. In the "clumps" the cells are closely packed together and fill the pockets formed in the connective tissue; in the masses themselves there is usually no elastin or connective tissue,

but in localized areas of the section there are broken-up elastin and collagen tissue lying between cells which are less closely packed, and the tissue is here œdematous. In the rows of cells which appear to come from the tumour in the hypoderm and lower corium, and to ascend along sweat-ducts and hair-shafts, as well as along blood-vessels not connected with these structures, the same type of cells is seen as in the clumps; and three kinds may here again be described as in the case of the first group of cases, namely, mononuclears, connective tissue, and epithelioid cells. Mast-cells are occasionally found in abnormal number. The blood-vessels appeared in many parts of the section thickened and even obliterated by endarteritis.

In many of the foci of cells there appears to be a central destruction. Giant-cells were found in one case (A. C.), but there was no typical "tubercular" structure.

A diffuse cell-infiltration in all these cases involved especially the fatty zone, which was in many places actually fibrotic in large areas. The cell-masses in many instances could be demonstrated to surround sweat-coils and ducts and hair-shafts.

Upon comparing these seven cases together, I think a gradual transition from the simplest case (that of Pringle) to the most complicated (that of Brocq) can be noted, and I am personally convinced that the disease in these seven cases was the same; in fact, the transition, to my mind, is almost like that of serial sections. In all we have to do with a deep hypodermic inflammation gradually spreading towards the surface and situated round vessels; the cell-masses observed in all the cases have much the same character as regards the cells composing them. In several instances of both groups there is a nodular necrosis observable. The constancy of the clinical appearances is another and an equally strong argument for their identity. In only one of the cases reported as of this type, that of Savill, are the histological features unlike, and on this ground I should be inclined to refuse recognition of this case, the diagnosis of which was very uncertain and the records utterly inadequate. In the case of Dubreuilh the thickening of the rete and other granular layers is also unusual, but the infiltration is, as in the seven cases here compared, deep seated and of the same type. In Jadassohn's case, which clinically was a little doubtful, there is the same deep-seated nodular infiltration, and I should regard this case as a true instance of the disease.

Nature of the Disease.—In view of the opinion of the tuberculous associations, which will be discussed at length later, it is

interesting to note that the earliest case recorded—that of Radcliffe Crocker, in his "Atlas" in 1893—was recorded under the title of lupus erythematosus. Dr. Crocker expressly states in his later paper on granuloma annulare that this earlier case was of this class.

Radcliffe Crocker has drawn particular attention to the frequency with which "warts" preceded the development of the eruption. It seems to me probable, however, that the tendency of patients to describe any excrescences on the hands under this generic title explains this frequency, for evidence of which reliance must usually have been placed on inexperienced narrators, who would be likely to mistake the early nodules for warts. Warts are epidermal; this disease is essentially non-epidermal, and no association between the conditions other than accidental can be conceived.

The exact relation to "granuloma annulare" of the group of cases named by Crocker "erythema elevatum diutinum" is very difficult to determine, especially as no accepted case of the latter morbid class has appeared at any of the dermatological societies for many years. The description of the case which formed the basis of Dr. Crocker's paper reads much like the condition seen in granuloma annulare in the histological features of a deep-seated inflammation of the corium, with fibrous changes resembling keloid. Crocker was "doubtful" as to the identification of this case with Galloway's case.¹ Galloway and Brocq are both inclined to associate this type closely with "granuloma annulare." The cases of Hutchinson, Judson Bury, and others included in erythema elevatum diutinum remain of uncertain nature.

Dr. Colcott Fox has called my attention to a case reported by Gallois under the title of gummata of the palm (which they certainly seem very unlike), which may be an instance of the disease,² and to an earlier case of Volkmann's, in a child, reported as spontaneous keloid. The illustrations of this case do not very closely resemble the clinical picture of granuloma annulare, but the position, the histological evidence of fibrosis, and the spontaneous origin may suggest this identification.³

The opinion that the disease under discussion is a type of lichen planus is held, I understand, by several observers; and there is no doubt much difficulty in distinguishing the circinate lesions of lichen

¹ Vide Galloway, *Brit. Journ. Derm.*, 1899, pp. 221, *et seq.*

² *Journ. de Méd. de Paris*, November 24, 1901, p. 278.

³ Von Langenbeck's *Archiv*, xiii.

planus from this eruption. Cases of lichen planus have, as I think, for example in Savill's report, been regarded as cases of this disease, but the histology to my mind is quite different. The granular layer, so notably increased in lichen planus, is not increased in the most typical examples of "granuloma annulare." The cell-infiltration in lichen planus is much more circumscribed and superficial; clinically the different incidence of granuloma annulare, its relative frequency in young children, in whom lichen planus is rare, the complete absence of notable itching, the lack of papules simulating lichen planus, the different distribution, all contradict the assumption of identity. The term lichen annularis for this disease, which Dr. Galloway, its inventor, has assured me was not intended to assume this identity, has undoubtedly confused the issue, and on these grounds alone I think this name should be discarded.

Rasch and Gregersen, in 1903, discussed in a very full and elaborate record of a case (reproduced here) the etiology of a group of cases which included Colcott Fox's, Galloway's, and Dubreuilh's first case. They drew attention to the close analogy with "sarcoids" of Boeck. Brocq also suggested the approximation of this group to "sarcoids," and Galewski, in fact, adopts this classification, his case being recorded as "tumores benigni sarcoidei cutis." I have not personally had an opportunity of seeing either a case or a section of "sarcoid," but on reading through the paper by Darier and Roussy on this subject I have been struck by several points of similarity.

Darier's sarcoids, as distinguished from Boeck's, originated deeper in the corium and showed a more tuberculous structure. Sarcoids, as described by Darier, are "neoplasms composed partly of inflammatory alterations of the adipose tissue, partly of tissue having all the characters of tuberculous tissue; originating in the hypoderm, the neoplasm appears to extend by invading the neighbouring fat-lobules and the lymphatic channels, and by following the vessels and sweat-ducts which serve as an axis upwards into the corium. These neoplasms are tuberculoid nodules surrounded by young connective tissue infiltrated with round-cells." Giant-cells may or may not occur. From their histological characters, from the history of the recorded cases, and from their tuberculin reactions, Darier regards sarcoids as being of the nature of tuberculides; no bacilli have been found in sections, and the injection of tissue from sarcoids into guinea-pigs has been negative; so that sarcoids occupy the following relation, in his opinion, to other clinically similar diseases with tubercular associations:—

Scrofulodermata: virulent to guinea-pigs; + bacilli.

Erythema induratum: virulent; no bacilli.

Sarcoids: non-virulent; no bacilli.

Patients the subjects of sarcoids react, both locally and generally, to tuberculin and the tumours diminish under treatment with tuberculin injections.

In the case of A. C., noted above, the patient reacted strongly to Calmette's test, and the tissue of a recent nodule injected into a guinea-pig produced no result. In her opsonic reaction she gave on only one occasion a heightened index, the other estimations, seven in number, showing a fairly constant index about the normal. This patient, moreover, presented signs of pulmonary tuberculosis, so that these tests, even if accepted as evidence of tuberculosis, are rather vitiated as regards their bearing on the skin lesions. I submitted sections of this case to Darier, who did not regard them as identical with his cases of sarcoid, though somewhat analogous.

The tuberculous association of these cases suggested by their histological similarities with "sarcoid" receives considerable confirmation from the clinical histories—a fact noted long ago by Crocker. The frequent mention in the synopsis of cases here submitted of tuberculous antecedents is striking; this is, indeed, perhaps the most frequent common factor in the cases recorded, and my personal view is strongly in favour of this etiology.

Treatment.—In my own cases local measures seemed satisfactory without any internal medication: salicylic acid, either in ointment or plaster, ichthyol or resorcin in ointment being adopted. In two cases the incidental application of dry dressings after a biopsy caused apparently the involution of the neighbouring lesions covered by the dressing. Jadassohn in his first case found cause to think internal administration of arsenic was more successful than local measures. The prognosis as regards the actual disease would appear to be uniformly good, since in all the recorded cases the skin lesions ultimately disappeared; but the possibility of recurrences, and the graver possibility of tuberculous associations should not be lost sight of in the general prognosis.

BIBLIOGRAPHY.

The following synopsis of cases furnishes a complete bibliography, which need not therefore be repeated.

TABLE OF CASES REPORTED AS "GRANULOMA ANNULARE," "LICHEN ANNULARIS," "RINGED

Case No.	Reference	Recorded by	Title of record	Sex	Age	Distribution of eruption
1	<i>Brit. Journ. Derm.</i> , 1895, p. 91	Colecott Fox	Ringed eruption	F.	11	Left ring finger, right little finger
2	Loc. cit., 1896, p. 15	Colecott Fox	Ringed eruption	?	2	Twelve to fifteen ringed lesions on buttocks and backs of thighs
3	<i>Ann. de Derm.</i> , 1895, p. 355	Dubreuilh	Eruption circinée chronique de la main	F.	33	Index and middle fingers of both hands, left thumb
4	Loc. cit., 1905, p. 65	Dubreuilh	Néoplasie nodulaire et circinée	M.	1½	On tendo Achillis (both sides), legs, and feet, right index, forehead
5	Loc. cit., 1905, p. 68	Dubreuilh	Néoplasie nodulaire et circinée	F.	26	Cleft of finger, back of hand, left index
6	Loc. cit., 1905, p. 69	Dubreuilh	Néoplasie nodulaire et circinée	F.	18	Base of left index
7	Communicated (1908)	Dubreuilh	Néoplasie nodulaire et circinée	M.	3	Dorsal base of index finger, radial edge of left hand
8	<i>Brit. Journ. Derm.</i> , 1899, p. 221	Galloway	Lichen annularis	M.	10	Fingers and thumbs of both hands, left ear
9	Loc. cit., 1902, p. 1	Radcliffe Crocker	Granuloma annulare	M.	20	Right wrist and thumb, left medius and fifth finger, ear, inner canthus, jaw, scalp
10	Loc. cit., 1902, p. 5	Radcliffe Crocker	Granuloma annulare	M.	21	Back of hand, wrist, nape of neck
11	Loc. cit., 1902, p. 5	Radcliffe Crocker	Granuloma annulare	F.	52	Wrist, nape of neck

ERUPTION," "NÉOPLASIE NODULAIRE ET CIRCONÉE," "TUMORES BENIGNI SARCOIDEI CUTIS," &c.

Initial lesion	Duration	Evolution of disease	Histology	General remarks
Nodule	2 mos.	Nodules formed rings, which extended peripherally; central skin normal	—	Suffered from pains in the shoulders, but no rheumatism; began in winter; no subjective symptoms
Nodule	5 mos.	Nodules formed rings with depressed atrophic centres; some lesions remained nodular throughout	—	Began in very hot weather; child quite healthy, no subjective symptoms
Lenticular swellings the size of lentils	5 yrs.	Nodules formed crescents and rings, central skin depressed, but became normal later	Diffuse cell-infiltration in middle zone of corium	Eruption disappeared quickly with ichthyol; no subjective symptoms
Papules, deep nodules	12 mos., with recurrence	Nodules formed rings and crescents, central skin depressed, but normal; recurred, no traces left finally	—	Digestion disturbed, but child otherwise healthy; family history good
White, hard nodule	4 - 5 yrs.	Peripheral extension, with central depression; no scar left	—	Very nervous patient, but no disease present; no subjective symptoms; lesion disappeared in two months with treatment
Nodule	2 yrs.	Nodules formed segments of circle; scar left as result of treatment with caustics; lesions recurred	—	Patient had good general health; family history good
Nodule	1½ yrs.	Rings made up of nodules, central skin normal	—	Child otherwise well; no family disease; no phthisis
Nodule	6 yrs.	Rings with white border, central skin slightly atrophied, rapid peripheral extension	Cell-infiltration in cutis, slight destruction of connective tissue	Personal and family history good; lesions disappeared in six months with treatment, but recurred three years later; wart on hand
Pale red nodules	4 yrs.	Nodules coalesced to form circles with depressed central skin	Thickened rete, sweat-coils infiltrated with cells, dense cell-mass in cutis	Delicate man, but no actual tubercular history; lesions itched slightly
Began as swelling with mat-tery head, also red papules	2 yrs.	Rings made up of nodules, which involuted, leaving reddened depression	—	One brother died of phthisis; no other family history; general health good, had ordinary warts on hand
Papules white, with red areola	2 mos.	Involuted, forming rings and crescents	—	Strong family history of tuberculosis; lesion disappeared within six months

TABLE OF CASES REPORTED AS

Case No.	Reference	Recorded by	Title of record	Sex	Age	Distribution of eruption
12	<i>Brit. Journ. Derm.</i> , 1902, p. 6	Radcliffe Crocker	Granuloma annulare	M.	11	Elbows, wrists, knees
13	Loc. cit., 1902, p. 7	Radcliffe Crocker and Pernet	Granuloma annulare	M.	Adult	Index
14	Loc. cit., 1902, p. 217	Radcliffe Crocker	Granuloma annulare	M.	Adult	Back of both hands, right index, left index
15	Loc. cit., 1899, p. 435	Pringle	—	M.	18	Neck, face, scalp, wrist
16	Loc. cit., 1905, p. 19	Pringle	Ringed eruption of extremities	M.	12	Hands, thigh
17	Loc. cit., 1902, p. 270	J.H.Sequeira	Ringed eruption	M.	28	Back of hands and fingers
18	Communicated	J.H.Sequeira	Granuloma annulare	F.	8	Right index, back right hand, right wrist, back of left hand
19	Communicated	J.H.Sequeira	Granuloma annulare	F.	21	Back of right wrist, back of left wrist, left index
20	Communicated	J.H.Sequeira	Ringed eruption	F.	8	Palms of hands, front of ankle
21	<i>Archiv. für Derm.</i> , 1903	Rasch and Gregersen	Sarcoid tumours	F.	33	Dorsal surface left index, fingers of right hand
22	<i>Ann. de Derm.</i> , 1904, p. 1089	Brocq	Néoplasie nodulaire et circonéc	M.	Child	Back, sides, and front of fingers
23	" <i>Traité de Derm. pratique</i> ," ii., p. 276	Brocq	Granuloma annulare	M.	Adult	Back of fingers
24	Loc. cit.	Brocq	Granuloma annulare	F.	Adult	Fingers and hands

"GRANULOMA ANNULARE," &C. (continued).

Initial lesion	Duration	Evolution of disease	Histology	General remarks
Like a flat wart	Over 1 yr.	Ring formed, with dark atrophic centre	—	Patient had had sunstroke, warts appeared synchronously with lesions
Nodules	?	Rings formed, consisting of reddened nodules	—	—
Ring with elevated edge	?	Ring enclosed pigmented and slightly atrophic skin	—	—
Papules and warty nodules	8 mos.	Skin between nodules was normal in colour, with natural lines deeper than usual	—	In addition to the ringed lesions there were ungrouped nodules on forehead; patient healthy and family history good
Nodules and rings	?	—	Sweat-coils slightly infiltrated and distended	—
Pale red spots, ? nodules	2½ yrs.	Centre of ring atrophic, with some pigmentation	—	History of tubercle in mother's family; patient pale, thin, with mitral disease; lesion disappeared spontaneously within six months
Nodules	Several months	Nodules formed rings	—	Cured with ung. acid. sal. in less than one month
Nodules	8 mos.	Nodules formed rings	—	Case lost sight of
Ringed patches	?	—	—	—
White nodules, later rings	1 yr.	Centre of ring smooth and "atrophic"	Cell-infiltration in corium, deeply situated, some areas of necrosis, elastin fragmentary in parts, connective tissue tumour	Family history good; disease recurred after six years interval; disappeared without trace; no subjective sensations
Warty nodule	—	Rings formed with depressed centre, becoming definitely cicatricial	Cell-infiltration in hypoderm and corium, sclerosis of fat-lobules, necrosis in some areas of connective tissue	Child otherwise well; lesions commenced as "warts" and were cured by Vidal's plaster
—	1 yr.	Rings disappeared with application of electro-cautery	—	—
—	—	Rings disappeared with application of salicylic acid plaster	—	—

TABLE OF CASES REPORTED AS

Case No.	Reference	Recorded by	Title of record	Sex	Age	Distribution of eruption
25	"Traité de Derm. pratique," ii.	Brocq	Granuloma annulare	F.	8	Ankle and knees
26	<i>Ann. de Derm.</i> , 1904, p. 9	Audry	Erythémato-sclérose circonécée du dos de la main	F.	50	Sides of medius and index
27	<i>St. Louis Hos. pital Mus. Catalogue</i>	Quinquaud (1891)	Fibrome fasciculé	—	—	Hands
28	<i>Brit. Journ. Derm.</i> , 1905, p. 23	T. D. Savill	Lichen annularis	M.	44	Neck, chest, upper limbs
29	Loc. cit. and communicated (1908)	Perry and Siehel	Granuloma annulare	M.	8	Extensor surface of hands and feet
30	Communicated (1908)	Leslie Roberts	Acanthoma annulare	F.	9	Both ankles, but chiefly right
31	Communicated (1908)	Hyde and Montgomery (notes by F. H. M.)	Ringed eruption	M.	16	Radial edge of left index
32	Communicated (1908)	Jadassohn	Granuloma annulare	F.	59	Axillæ, groin, elbow, wrist, knees
33	Communicated (1908)	Jadassohn	Granuloma annulare	F.	4	Left hand, right hand, right foot, both thighs
34	Communicated (1908)	Adamson	Ringed eruption	M.	3½	Buttocks, back of thighs
35	Communicated (1908)	Adamson	Ringed eruption	M.	2½	Elbows, buttocks
36	<i>Brit. Journ. Derm.</i> , June, 1908	Adamson	Nodular ringed eruption	M.	17	Back of fingers of both hands

"GRANULOMA ANNULARE," &C. (continued).

Initial lesion	Duration	Evolution of disease	Histology	General remarks
—	2 yrs.	Rings formed	—	—
Hard pink nodules	8 mos.	Rings formed with nearly normal centre	Histology "like Dubreuilh's"	—
Nodules	—	—	Histology suggested name "fibrome fasciculé"	—
Rings	6 mos.	Diagnosis doubtful; treated for five months with mercury and iodides on syphilitic hypothesis	—	—
Nodules	3-4 mos.	Rings, made up of papules, disappeared	Sweat-coils dilated and infiltrated; some general cell-infiltration in cutis	Personal and family history good
Nodules	1 yr.	Large rings formed by slow peripheral extension; no scar left	Hypertrophy of epidermis, no cell-infiltration, sweat-ducts dilated	Hands "bluish"; no chilblains
Nodules	2½ yrs.	Border of rings suggested keloid in colour and density; central portion normal	—	Nodules were left after rings disappeared; eventually no trace left; patient delicate health
Nodules and rings	3 yrs.	Some pigmentation left; very large rings and patches formed of nodules disappeared and recurred	Some grouped cell-masses in deeper part of corium, elastin broken up in these places	General health good; no tubercle; some gouty and nervous traits
Circinate patches of nodules	1 yr.	Some patches disappeared spontaneously	—	Itching complained of, not confined to patches, child otherwise in good health
Nodules and rings	6 mos.	Rings with edge made of distinct nodules, and with pink centre	—	No history of rheumatic fever; no evidence of tuberculosis; child in good health
Lumps and rings	1 mo.	Lilac rings with central enclosed part darker; nodules on elbow	—	—
Small red lumps	5 mos.	Tendency of nodules to group in rings, eruption disappeared suddenly within fourteen days after biopsy of one lesion	Collections of mononuclear round-cells around blood-vessels and sweat-glands	—

TABLE OF CASES REPORTED AS

Case No.	Reference	Recorded by	Title of record	Sex	Age	Distribution of eruption
37	"Iconographia Dermatologica," Fasc. iii., 1908	Galewski	Tumores benigni sarcoidei cutis	F.	26	Forearm, right index finger
38	<i>Brit. Journ. Derm.</i> , 1908	Dawson	Granuloma annulare	M.	22	Left hand, over fingers and back
39	Communicated	MacLeod	Granuloma annulare or lichen planus annularis	M.	43	Left hand; later recurrence on both hands
40	Communicated	Darier	Granuloma annulare	F.	?	Thigh
41	Communicated	Darier	Granuloma annulare	F.	?	Hip
42	Communicated	Montgomery	Granuloma annulare	F.	-	Leg
43	Communicated	Colcott Fox	Ringed eruption	F.	35	Back of both hands, index finger
44	Case 1.—H.M.	Graham Little	Granuloma annulare	F.	6	Radial edge, right hand, external malleolus, left foot
45	Case 2.—E.W.	Graham Little	Granuloma annulare	M.	3	Front of left wrist
46	Case 3.—E.P.	Graham Little	Granuloma annulare	F.	16	Dorsum and side of right hand
47	Case 4.—W.S.	Graham Little	Granuloma annulare	M.	42	Front of both wrists; elbows, knees, nape of neck, fingers
48	Case 5.—E.C.	Graham Little	Granuloma annulare	F.	4	Buttocks, one lesion on each side; nowhere else
49	Case 6.—A.C.	Graham Little	Granuloma annulare	F.	18	Base of index and little finger; wrist, arm, breast, tendo Achillis, toes, foot, back, neck

"GRANULOMA ANNULARE," &C. (continued).

Initial lesion	Duration	Evolution of disease	Histology	General remarks
Spots developing into nodules	6 mos.	Nodules formed crescents and rings; the centre of these showed normal skin or at most slight atrophy; disease cured and recurred a year later; finally disappeared	Diffuse cell-infiltration in cutis of fixed connective tissue cells	—
Nodules with red areola, later rings	7 yrs.	—	—	—
Nodules with involution, forming rings	14 dys.	Lesions disappeared rapidly; recurred a year later on same part and then also disappeared rapidly	—	Digestive disturbances and nervous depression complained of
Nodules	?	Circinate rings	—	Diabetic and syphilitic
Nodules	?	Circinate rings	—	Diabetic
Ring	?	—	Keloid-like	—
Nodules and rings	Many years	Case lost sight of	—	Chilblain circulation; hands blue
Nodules forming ring	5 mos.	White raised border, became red later; disappeared completely in about three months with treatment	Nodular infiltration of cells round sweat-ducts and glands, some areas of necrosis	Child perspired freely and was not robust, but showed no definite illness; had had "nettle rash" fourteen days before appearance of "granuloma"
Nodules forming rings	3 mos.	Central portion of ring pinker than normal, with some slight appearance of atrophy	—	—
Ring of papules	?	Lesion disappeared within a few weeks (probably fourteen days)	—	Slight itching complained of
Nodules and rings	3 yrs.	Some lesions disappeared rapidly, others persisted, and new ones came	Nodular infiltration and grouped cells round sweat-glands and vessels, fatty sclerosis and necrosis of connective tissue	Man perspired copiously and was thin and delicate-looking; no history of phthisis
Nodule and ring	6 mos.	Central skin darker in colour; no actual atrophy, but slight whitish lines left	Nodular infiltration of cutis, some areas of necrosis of connective tissue	Strong tubercular family history; patient personally well
Nodules and keloid-like swellings	5 mos.	Nodules formed imperfect ring in some cases; no ulceration, but many lesions left pitted scars	Nodular infiltration of hypoderm and corium, fatty sclerosis, giant-cells	Tubercle of left apex; positive Calmette reaction; nodule injected in guinea-pig gave negative result

ILLUSTRATIONS OF "GRANULOMA ANNULARE" PREVIOUSLY PUBLISHED.

CROCKER.—"Atlas," Plate lxvii., labelled "Lupus erythematosus of Backs of Hands," figs. 1 and 2.

GALLOWAY.—*Brit. Journ. Derm.*, 1899, p. 221. Coloured plate showing clinical character, and photograph of histological aspect.

CROCKER.—*Brit. Journ. Derm.*, 1902, p. 1. Coloured plate of clinical characters of three cases, and photograph of histological appearances of one.

BROcq.—"Traité de Dermatologie pratique," ii. Photograph of clinical aspect.

RASCH and GREGENSEN.—*Archiv f. Derm.*, 1903, p. 337 (histology only illustrated).

GALEWSKI.—"Iconographia Dermatologica," Fasc. iii. (clinical and histological).

DISCUSSION.

The PRESIDENT said that the Section was greatly indebted to Dr. Graham Little for his important contribution. Those who had been through the "mill" knew the enormous amount of time and trouble that such a paper entailed. He (Dr. Radcliffe Crocker) naturally had special reason to be interested in the subject. It was in 1893 that he published his first case of granuloma annulare, although at that time he was under the erroneous impression that it was related to lupus erythematosus. The similarity was one which had not escaped other observers. In some cases lupus erythematosus was suggested very decidedly; in others there was very little suggestion. Probably there was not much relationship between the lesions save in slight clinical features. Dr. Graham Little had put emphasis upon the observation that the lesion was produced from the grouping of the nodules and not from a single nodule. This was a point upon which he (Dr. Crocker) had also laid stress, and one in which his cases differed from those of Dr. Colcott Fox. They had to remember that a single nodule might be an accidental thing, and it was only by taking a large number of cases that they could arrive at definite conclusions. Furthermore, the histology of an old lesion and of a new one differed in many ways. When he first came to the study of these cases he had only a single nodule to found his ideas upon. He put the half dozen cases which fell under his notice into the *British Journal of Dermatology*,¹ and reprinted the article as a pamphlet. There was one feature of these cases that he believed Dr. Little had not mentioned, namely, the presence of common warts. [Dr. Little signified that this was mentioned in the full paper, of which he had only read an abstract.] It was a fact that in several cases common warts had been antecedents and concomitants of granuloma annulare, and although they did not know that there was any rela-

¹ *Brit. Journ. Derm.*, xiv., No. 159.

tionship, and histology certainly did not show any relationship, such a point in a rare disease was worth mentioning. Another thing to be noted was the frequency of nodules on the nape of the neck. Nodules on the neck appeared on the neck were also found in some of them. In that region, of course, they could be seen more easily than elsewhere. With regard to the likelihood of the two diseases, granuloma annulare and lichen annularis, being one he was quite open to conviction, and all would be glad to reduce the number of diseases.

Dr. JAMES GALLOWAY said that he desired to join Dr. Crocker in thanking Dr. Graham Little for the very complete paper which he had read before the Section. He considered that, as the result of Dr. Little's painstaking work, their position as to the class of disease to be considered as belonging to the category of "lichen annularis" had been much more closely defined. It was especially as regards the types of indolent tumefaction of the skin described by Continental observers, commencing with Dr. C. Boeck, of Christiania, and more recently by several French authors, under the name "sarcoid"—subcutaneous or benign—that confusion may have arisen; but these would now disappear from the horizon when considering the disease which was the subject of Dr. Little's paper. In reference to the group of benign "sarcoid" tumours, while prepared to admit their analogies and possibly their relationship with certain tuberculous affections of the skin on the evidence put forward by Boeck, Darier and Roussy, and Thiebierge, he thought that by no stretching of classification could they be put in the same category as the true cases of lichen annularis mentioned by Dr. Little. With these "sarcoid" tumours members of the Section were no doubt familiar. Examples, he thought, had been brought forward on various occasions; he recollected at the moment cases shown to the Dermatological Society of London by Sir Stephen Mackenzie. In one of the most recent, viz., that described by Dr. Galewsky, of Dresden, he thought that the name of "sarcoid" was especially misleading; judging by the description and by the illustration it was an example of lichen annularis and had no resemblance to the sarcoids of Boeck, Darier, and Thiebierge. The name used by Gougerot in describing one of the French cases, viz., "lymphosarcoïde," in which numerous small tumours were present in the skin and subcutaneous tissues, suggested how little was the resemblance between these and lichen annularis. Dr. Little had been unable to suggest the factors concerned in producing this skin affection, but he hoped that information as to this might be forthcoming. Dr. Galloway added that he could not allow the opportunity to pass without entering a vigorous protest against the use of the term "granuloma" given to this disease. The word "granuloma," an unhappy one at the onset, had come to be specially applied to certain characteristic morbid processes occurring in the course of certain specific infections—the infective granulomata. The structure of these tumours was well known; the peculiar cells which formed part of the structure could be recognized, but according to the evidence of those who were actually using the word "granuloma" in the name "granuloma annulare" the histology of the small tumours present in that disease was

in four out of six cases which he brought forward in 1902. When Dr. Graham Little brought his cases for diagnosis to the Dermatological Society, nodules clearly not that of the infective granulomata. Wrong, therefore, in its application in the histological sense, it was surely a still greater error to make use of a term signifying a type of morbid process in order to designate as a clinical term a special disease. He had a certain amount of sympathy with those who evidently wished to limit the application of the ancient term "lichen" to the disease known as "lichen planus," but he considered that it was as yet premature to make such an effort with the prospect of success, for the etiology of that disease was unknown. Indeed, the attempt to do so failed on all sides. They had heard Dr. Little, in the course of his paper, speaking of lichen scrofulosorum, and anyone listening to the discussions in this room would hear the terms "lichen spinulosus," "lichen pilaris," &c., in constant use. He thought that Dr. Crocker was more happily inspired when in the early days of this discussion the idea had occurred to him of the relationships possibly existing between such diseases as lupus erythematosus (so-called) and lichen planus, with their strong suggestions of a toxæmic origin, and the disease to which Dr. Little had drawn their attention, than when in later days, in an unhappy moment, he had applied the name "granuloma" to the cases he had described. The disease under discussion answered to the most strict definition of the old medical term "lichen" used by Hippocrates and accepted by Willan; its curious annular distribution could not fail to be recognized, so that its name of lichen annularis was very naturally employed.

Dr. GEORGE PERNET said that he had already pointed out to the members of the Section that in granuloma annulare there were no plasma-cells—a point which had also been brought out by Dr. Graham Little. The absence of plasma-cells inclined him to agree with Dr. Galloway that they ought to re-christen the lesion, and not include it among the granulomata, a feature of the granulomata being the plasma-cell formation. He suggested the name of "celluloma annulare," which, although it might equally fall under Dr. Galloway's condemnation as barbarous, at least did not commit one to specific histological surmises.

Dr. T. COLCOTT FOX said that he had brought two or three drawings of cases bearing upon the subject of the paper. One was a case by Professor Volkmann in which there was spontaneous keloid of the fingers and toes in a little child. Another, which he thought would also interest the Section, was by Tengier, who had published a case he had called "sarcoma of the hands and of the knees," which was very suggestive indeed of erythema diutinum, or the malady that Dr. Graham Little had been discussing. He mentioned a third case which was called "multiple gummata of the hands occurring in a child," the palms and backs of the fingers being covered all over with little nodules. There was a history of syphilis in that case. Another case of interest was recorded in the *British Journal of Dermatology* by Dr. Smith, of which a drawing was shown by Dr. Colcott Fox. It was described as a case of erythema diutinum. Microscopically the nodules were fibromatous.

Dr. CROCKER said that the nodules invariably became fibromatous at a later stage of the lesions.

Dr. H. G. ADAMSON suggested that, in the present state of our knowledge, the lesion having been referred to as an annular eruption, the name "nodular ringed eruption" would answer the purpose better than any other.

Dr. GRAHAM LITTLE thanked the members for their attention, and explained that he had only read an abstract of the paper, which was a very difficult one to read in full. He thanked Dr. Crocker and Dr. Fox particularly for their pictures of cases, which made a very important addition to the illustrations he had been able to gather and to show upon the table.

Case of Sclerodermia (Morphœa).

By H. G. ADAMSON, M.D.

THE patient was a girl aged 10 years. There was a characteristic patch of sclerodermia measuring $1\frac{1}{2}$ in. by 1 in., with a well-marked lilac border, situated on the back immediately to the left of the third dorsal spine, with its long axis horizontally. The exhibitor was inclined to the view that sclerodermia was a lesion of toxic origin, and that it was not very distantly related to the scar-leaving erythemas. The case was shown because it seemed to lend support to this view. The lesion had developed rapidly (in two months) from an erythematous patch. Examination of the patch by palpation at once caused a very marked erythema of the skin immediately around, and there was an associated condition of factitious urticaria. Cases of sclerodermia had been recorded associated with rheumatic or arthritic symptoms, with urticaria, with peripheral neuritis, with lupus erythematosus, and with changes in the thyroid gland—all of which conditions pointed towards some form of toxæmia.

DISCUSSION.

Dr. PERNET said that he had long taught that sclerodermia was of toxæmic origin, and that his treatment of these cases had been based upon this assumption.

Dr. CROCKER said that there was nothing against such cases being toxæmic, and, indeed, it was likely if associated with other evidence of toxæmia. He regarded them as very mysterious cases.

**Case of Tuberculosis developing on the Site of a
Vaccination Scar.**

By J. L. BUNCH, M.D.

THE patient was a little girl aged $7\frac{1}{2}$ years, who had been vaccinated when 3 months old. Portions of two vaccination scars are still visible, but the greater part of these scars is now obscured by a red, scabbed, irregularly shaped superficially ulcerating lesion, measuring about 3 in. by 2 in. The edges are slightly thickened, the base of the ulcer shows granulations, and at the margin are some indefinite nodules of small size. The lesion commenced with one or two pinkish spots rather more than six months ago, which gradually increased in size, became more indurated and broke down, forming a superficial ulcer. The parents are apparently healthy. They lost one child when it was quite small, but there is no history of tuberculosis in the family.

Case for Diagnosis.

By E. G. GRAHAM LITTLE, M.D.

A MAN aged 37 was shown with two large ulcers on the right cheek, in the midst of greatly thickened infiltrated skin. These ulcers were deeply excavated, the floor covered with granulation tissue; they had persisted in the present condition for about three months and had been preceded by an eruption of "sores," which would appear to have been sycosis of the beard, traces of which are still present. A similar eruption, apparently a pustular folliculitis, had been noted in the hair of the axillæ. The ulcers, when shown, were scabbed over with heaped-up rupia-like crusts; they were 1 in. by $\frac{1}{2}$ in. and $\frac{1}{2}$ in. by $\frac{1}{4}$ in. respectively. A scraping from the surface showed no spirochætæ. No other symptoms were present with the exception of some nebulae on the cornea. The pupil was widely dilated, the iris possibly adherent.

He had had, when aged 14, a sore on the glans penis, apparently occasioned by phimosis and subsequent slitting of the prepuce. No specific history was obtained, and no signs of congenital syphilis in the teeth. The report of the ophthalmic surgeon to St. Mary's Hospital was that there was "pannus" of the eye, but no symptoms either for or against the diagnosis of syphilis.

Case of "Pseudo-pelade of Brocq."

By E. G. GRAHAM LITTLE, M.D.

EMMA G., aged 28. Hair began to come out five years ago at the top of the scalp. No subjective sensation in connection with the loss of hair. The mother had also lost her hair when aged 38, and the hair has never returned. The beginning of the loss of hair in this patient was not specially remarked. No redness seen. *Nil* elsewhere. Father died suddenly of a "complication of diseases." No phthisis.

Present Condition.—The vertex is the principal seat of disease, and for an area about 5 in. by 3 in. there is a bald expanse with some few isolated hairs, quite long and apparently normal, but with unusually deep infundibula of the follicle. The wide area is bounded by irregular contour, there being small, round, bare patches in parts at the junction of the central area.

In this way the baldness is encroaching upon the hairy scalp, especially at the back. The hairs can be readily pulled out without having the root-sheath adherent to the bulb; hairs extracted in this way, cut into fine pieces and planted on agar and serum respectively, produced no culture within forty-eight hours.

Sections from a Case of Urticaria pigmentosa in an Adult.

By E. G. GRAHAM LITTLE, M.D.

THIS was a private patient who had promised to come to the Society that day, but had been prevented. The patient was a married lady, aged 40, who for the previous eight years had had a slowly increasing eruption of macules on the forearms. She had been sent by Dr. Dewey, of Portsmouth, who had been kind enough to obtain a section of the skin, now shown. This demonstrated the presence of mast-cells in abnormal numbers in the papillary body of the corium, around the surface vessels in that part, and confirmed the diagnosis of urticaria pigmentosa. The case recalled clinically and in its history an adult case shown by Sir Malcolm Morris at the Dermatological Society of London, in which the diagnosis of urticaria pigmentosa had been made, but

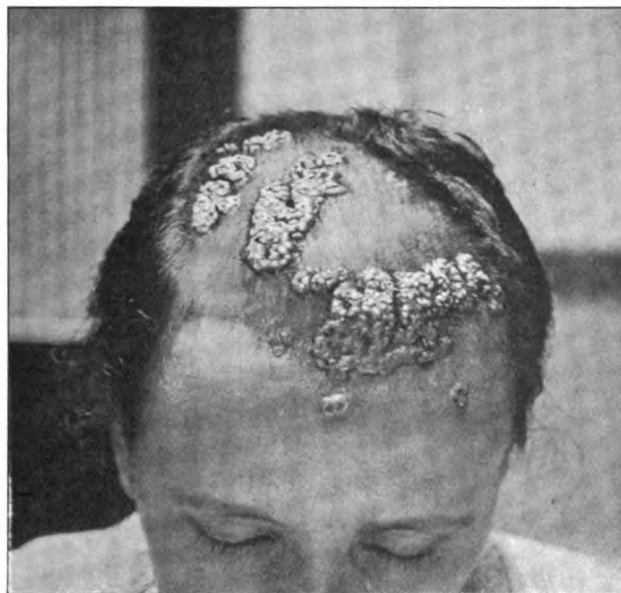
without the confirmation of a section of the skin. Urticaria pigmentosa with the history of commencement at so late an age was excessively uncommon in adults. In the present instance the husband had had syphilis, and it had been feared that the eruption in the wife was syphilitic.

Case of "Dermatitis papillaris capillitii" (Kaposi).

By J. M. H. MACLEOD, M.D.

THE patient was a healthy-looking woman, aged 32, who was sent up to Charing Cross Hospital by Dr. Thomas Pearson, of Peckham Rye, four months ago on account of a pustular affection of the scalp, which had proved singularly resistant to treatment. At that time the scalp was found to be covered in places with adherent greenish yellow crusts. On raising these up the underlying skin was found to be irregular, raised, and moist from a sero-purulent discharge. The affection had its origin several months before in an injury to the back of the scalp by a hat-pin, which had resulted in a suppurating sore. This had healed, but the present eruption seemed to have developed in consequence of it. An examination of a number of short hairs on the patches was made to see if any fungus was present, as several of the patches somewhat suggested kerion ringworm. The hairs came out easily and were surrounded by a purulent sheath. No ringworm fungus was found. From the clinical appearance and history of the lesions the diagnosis was made of a vegetating pyodermic infection, of the type described by Kaposi under the heading of "dermatitis papillaris capillitii." Antiseptic treatment was recommended, which was thoroughly carried out but had comparatively little effect, and the patient was again sent up to the hospital a week before she was exhibited to the Society. Her condition, when seen again, was as follows: The hair was clipped close over the affected area and the crusts had been entirely removed from two lesions. Extending from the forehead to the upper part of the occiput were a number of irregularly shaped, pinkish red, vegetating patches, varying in size from a split pea to 2 in. in diameter. The vegetations were regular, rounded on the top, and were all about $\frac{1}{8}$ in. in height, and about the size of small shot. Much of the hair had disappeared over the patches, but here and there tufts of hair were noticed projecting from the vegetations or growing up

between them. The pre-auricular and post-auricular glands, especially those of the left side, were enlarged. The case seemed to belong to the type described by Kaposi, but differed from the classical cases in that it did not affect the nucha and the neighbouring occiput, and there were no nodular lesions or keloidal changes. It was decided to treat the case by X-rays, and a full Sabouraud dose was given to each of the patches.



Dermatitis papillaris capillitii (Kaposi).

Case of Mycosis fungoides.

By H. RADCLIFFE CROCKER, M.D.

THE patient was a private case, a lady suffering from mycosis fungoides. The lesions on the face had been treated with the X-rays, but had not altered so much as the lesions in other parts, which had been treated with internal administration of salicin. The characteristic tumours were fairly abundant on the limbs and shoulders.

DISCUSSION.

Dr. PERNET drew attention to the fact that the ancestors of patients suffering from this disease had frequently been long-lived on one or other side of the family. It proved to be so in this case.

Mr. HARTIGAN asked for particulars as to the X-ray exposures, and whether the arm as well as the face had been exposed.

Dr. CROCKER said that he gave only one short exposure for the arm, and as the lady was anxious about her face the X-ray treatment was then concentrated there. The face received ten short exposures, with about $\frac{2}{10}$ ma. in the tube.

**Unusual Case of Pustular Vegetating Dermatitis, with
Pigmentation Changes, in a Woman aged 26.**

By H. RADCLIFFE CROCKER, M.D., and GEORGE PERNET, M.D.

THE disease in this case had been going on for nearly two years, commencing on the scalp, according to Dr. Ransome, of Bungay, who had observed the case from the first. The parts affected were the scalp, the nares, the left eyebrow, the right axilla, pubic and adjacent regions of the genitalia, and the greater part of the centre of the back. The condition came apparently nearest to what had been described by Hallopeau as "dermatite pustuleuse chronique en foyers à progression eccentricque," but had also affinities with impetigo herpetiformis. In the present case the disease commenced some six months after confinement; child living and healthy. The opsonic index to staphylococcus was 1.26. A drawing was shown of the patient's condition when first admitted to University College Hospital, and also Hallopeau's, Neumann's, and Hebra's plates. The case is being worked out and details will be published later as a paper.

DISCUSSION.

Mr. HARTIGAN asked whether any histological examination had been made, and if so whether any organisms had been found in the lesions.

Dr. PERNET said that they had not finished the examination. They had not yet looked for fungus elements.

Case of Lichen plano-pilaris.

By T. D. SAVILL, M.D.

(For Mrs. T. D. SAVILL, M.D.)

IN the absence of Dr. T. D. Savill this case was exhibited by the Secretary. The patient was a married woman, aged 30. She had two healthy children and considered that she possessed good health. Her mother had died of "consumption" at the age of 34; her father, three sisters, and a brother were alive and healthy. The patient was first seen on April 28, 1908, and gave a clear account of her malady. In the middle of March she had first noticed on the external surface of the right thigh a number of "rough grey pimples"; gradually a redness of the skin had spread between these. A few weeks later similar eruptions had started on the trunk, chiefly on the anterior surface of the chest; and when "red spots" began to appear on the arms, about the end of April, she thought it time to seek advice. Only slight itching had been present at any time. She had also experienced more lassitude than usual, but had not been prevented from performing her customary duties.

When the patient was first examined the eruption presented three distinct clinical types:—

(1) On the external and extensor aspect of the right thigh, where the disease had first appeared, there was an irregular patch, somewhat larger than the palm of the hand, of reddened thickened skin, covered with spines which projected from the surface quite $\frac{1}{8}$ in. These could be picked out, a gaping follicle with wide mouth being left behind.

(2) On the chest and abdomen were numerous groups of tiny conical papules; some of these had horny spinous projections similar to those on the thigh. There was, however, no redness at the base of these papules, and the intervening skin was healthy.

(3) On the right arm were five or six definite lichen planus papules, violet in hue, flat-topped and waxy in appearance.

On June 18, after emollient treatment had been employed for nearly six weeks, the change in the eruption may be briefly described as—(1) on the thigh the horny projections were less prominent;

(2) new groups of conical papules had appeared on the trunk, and in the old groups a degree of congestion was visible at the base of and spreading between many of the papules; (3) many definite new papules of lichen planus were scattered about on the forearms.

Microscopic sections were taken from the thigh and the arm on April 28. The section from the thigh, representing the clinical appearances described under (1) on preceding page, showed follicles widely dilated, especially at the mouth, and full of horny material, *i.e.*, a hyperkeratosis was present in the hair follicles. Between the follicles the epithelium presented the condition of a lichen planus papule, with swollen or hyaline cells, and marked small cell infiltration immediately beneath the Malpighian layer. The section taken from the arm showed, as was expected from the clinical appearance, a typical lichen planus papule. On June 16 a section was taken from an old group of conical papules on the chest, with some congestion at their bases [(2) previous page]. The follicles were similar to those found in the section from the thigh; infiltration of the corium was present around the follicles, and spreading to the intervening parts; between the follicles the epithelium was thrown into irregular ridges, and below one of these ridges considerable infiltration was present in the corium, suggesting that a lichen planus papule was in process of formation in that situation.

Case of Lupus erythematosus in a Child.

By J. H. STOWERS, M.D.

THE patient, a girl aged 5 years and 2 months, was sent to the Hampstead and North-West London Hospital on account of a symmetrical eruption of the face of several months duration, involving the cheeks, nose, eyelids and forehead.

When first seen the inflammatory redness and swelling—quite erysipelatoid in appearance—were so marked, especially at the margins, and the secondary incrustation so considerable, that it was impossible to decide immediately upon the exact nature of the case. A week later, after the removal of crusts, &c., the inflammatory swelling and surrounding œdema having lessened, the characteristics of the disease were distinguishable. At that time the ears were not implicated, the mucous membrane of the mouth was free, and the surface of

the body generally was normal. There was, however, upon the scalp a rough scaly patch of irregular shape about 2 in. in diameter, on which hairs of disordered nature and some superficial scarring were visible. This patch was stated to have existed for over two years and to have been actively treated for "ringworm," but a microscopical examination by one of the resident medical officers was attended with negative results. It is more than probable that this is part of the original development of the present disease. Quite recently the skin of the ears has become implicated and the eruption is now spreading in a discrete form, with some coalescence upon the forearms attended with itching.

So far the general health of the child has remained fairly good, but the parents are in poor circumstances—the father being out of employment; consequently she has suffered for want of appropriate food, &c. The urine upon examination did not contain albumin, and the specific gravity was normal. There is no history of tuberculosis in the family, but it is quite possible that the glandular affection of the neck was of tubercular nature, although corroborative evidence does not now exist.

The patient is to be admitted into the children's ward for observation and treatment, and a subsequent report will be made to the Section.

The special features of the case, among others, are :—

(a) The age of the patient, but few instances of lupus erythematosus occurring in early childhood being recorded :

(b) The rapid onset and markedly inflammatory nature of the disease ; and—

(c) The symmetrical and increasing development upon the forearms.

DISCUSSION.

Dr. CROCKER said that he had drawn attention to cases of lupus erythematosus in which the patients had been of tender age. The earliest age he had found a patient suffering from this disease was 5 years.

Dr. PERNET asked whether any albumin had been found in the urine.

Dr. STOWERS said that the urine was normal ; it had been examined that day.

Case of Molluscum contagiosum in an Adult.

By J. H. STOWERS, M.D.

A YOUNG married woman, aged 22, was exhibited with numerous lesions of this ailment existing upon the dorsal surface of each hand and upon the extensor and flexor aspect of each forearm. They were first noticed about seven months ago, and have rapidly increased in number since. The patient had been engaged in nursing several infants last year, previous to her marriage at Christmas, but no history of contagion was obtainable. Several of the nodules were flat and elliptical in shape, due to coalescence of the lesions, but the vast majority were characteristic in appearance, having the usual umbilicated centre.

Dr. WHITFIELD said that certain birds, such as pigeons, linnets, and domestic fowls, suffered from a similar disease, and when handled they sometimes caused the affection to be set up in the human subject. In reply to Dr. Whitfield, the patient said that she kept a linnet.

Specimens from a Case of Syphilis.

By A. WHITFIELD, M.D.

(1) A PHOTOGRAPH of the axilla of a girl, aged 18, who had contracted syphilis, as far as could be ascertained, about four months ago (fig. 1). When seen the throat showed the common type of grey erosion, and on the neck was a slight increase of pigmentation with leucodermic areas (leucoderma syphilitica). There was no eruption elsewhere with the exception of typical condylomata in the axillæ, from one of which the photograph was taken. Dr. Whitfield said that although a well-known possibility, the occurrence of condylomata in the axillæ was not, in his experience, common. He thought when he saw the lesions that it would afford good material for demonstrating the *Spirochæta pallida*, and this had proved to be the case.

(2) A preparation from the foregoing case stained by Leishman's method. Dr. Whitfield said that he had obtained far better specimens by this than any other method, and he had, he thought, tried most of those published. The specimen was fixed with methyl alcohol, then washed over with normal human serum, and then stained for an hour under cover with equal parts of Leishman's stain and distilled water. It was then washed for about a minute in distilled water, dried in air, and mounted.

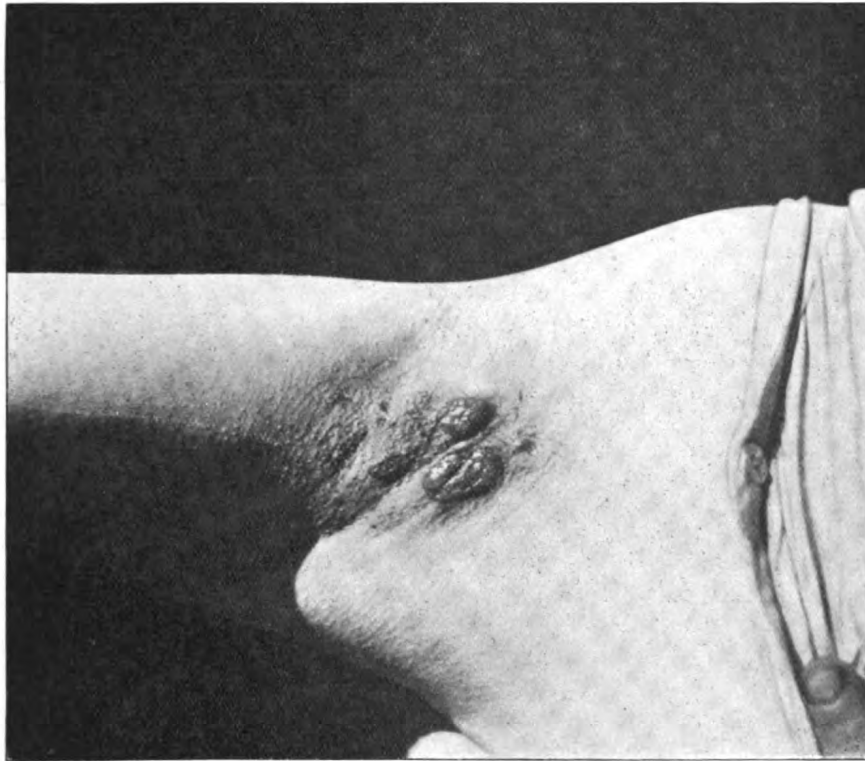


FIG. 1.

Condylomata in the axilla.

(3) A photograph of the specimen at a magnification of about 1,700 diameters (fig. 2). This was shown to demonstrate how well the purple red of Leishman's stain lent itself to photography, even in the case of such delicate organisms as the *Spirochæta pallida*.

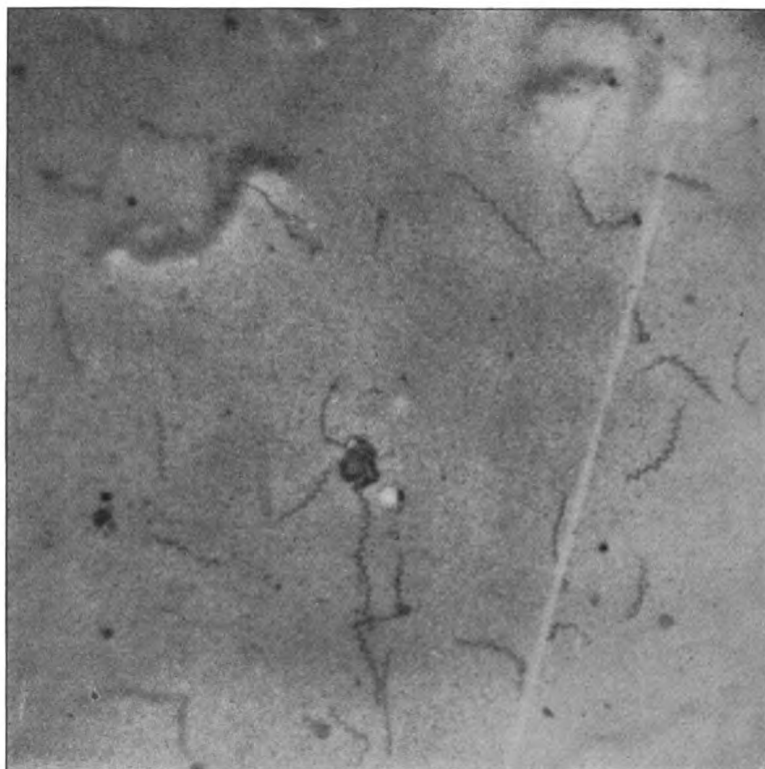


FIG. 2.

Photograph of preparation stained by Leishman's method.

Dr. CROCKER said that the specimens were excellent. With regard to condyloma in the axilla, he thought it only occurred among people whose bodies were very moist. He could not remember any special case.

Dermatological Section.

July 16, 1908.

Dr. COLCOTT FOX, Vice-president of the Section, in the Chair.

Case of Tuberculides in a Girl aged 11 years.

By J. L. BUNCH, M.D.

THE condition had been present since last Christmas, and the girl had been treated with boracic fomentations. The mother first noticed a patch on the left leg, and it had spread from there, the right leg subsequently becoming involved in a similar manner. It was now fairly symmetrical on both legs. There were well-marked hæmorrhages, and a granulomatous swelling was present on the back of the right leg, and to some extent on the left. There was a small lesion on the right cheek, with papules round it, which was not present when he first saw her; it was possibly partly due to the dressing. There was a history of tuberculosis in the family, an aunt having died of the disease at the age of 23.

Dr. COLCOTT FOX and Dr. GRAHAM LITTLE regarded the condition of the legs in this case as chronic pus infection, and questioned the tuberculous character.

Case of Parakeratosis variegata.

By G. DAWSON, F.R.C.S.I.

THE patient, a woman, was shown last winter, when Dr. Crocker said he thought it was a case of parakeratosis variegata. The rash occurred two and a half years ago on the ears and face, and now it had extended on to the knees and arms, and there was some on the buttocks. It was

intensely irritative, and kept her awake at night. It had not been treated by any drug. He could not find any reason for the peculiar distribution. At first he thought it was lichen planus, but there had never been any thickening. He did not think the mucous membrane of the mouth had ever been involved.

A section from the case was exhibited.

Dr. COLCOTT FOX questioned the diagnosis of parakeratosis variegata, but was not prepared with an alternative one.

Erythematous Eruption of Unusual Type.

By T. COLCOTT FOX, M.B.

THE patient, a milkman, aged 20, states that the present attack began about Whitsuntide, first as small, slightly raised blotches on the hands, then on the feet and body. He has not any joint trouble, pains, or marked constitutional disturbance. There are confluent round patches of erythema, disappearing on pressure, all over the hands and feet. The palms and soles are diffusely involved, but there are large round macules on the borders and disseminated over the dorsum of several of the joints, where they are raised, thickened and opalescent, suggesting a certain amount of serous exudation. There are a few patches over the elbow-joints externally, and one or two symmetrical patches on each forearm; also on the sides of the legs. The mouth is free. The man states that the scalp was affected, but it is now free, and as there is an ill-defined roughened patch on the centre of the sternum there may have been some pityriasis. The man also states that he had a similar outbreak last Christmas, and that his scalp was first involved, and then the arms and chest. The eruption disappeared about Easter time. The exhibitor said he had brought the case because, although the type was erythema, the picture on the hands and feet especially was very striking and unusual, and the individual lesions and the eruption as a whole were more prolonged than usual if the man's story was to be depended on. The exhibitor said he also had under observation a very similar case in a woman, who had long suffered from a chronic patch of lupus erythematosus of the nose, with lesions of the backs of the fingers, and who suddenly had an outburst of large macular erythema (acute lupus erythematosus?), with marked incidence on the hands and feet. The outburst was, however, of short duration.

Case of X-ray Dermatitis.

By WILFRED FOX, M.D.

THE patient, a medical man, showed on his hand an early stage of X-ray burn. The first sign of it appeared in the middle of April, and Sir Malcolm Morris had watched the condition with him since then. It had gradually progressed, and there was steady infiltration. It arose from the frequent screening of patients, and was a "series burn." It was steadily becoming more painful, especially about the nails. There had been no injected venules, but slight pressure produced pain. He asked whether anyone could suggest any means of stopping the pain.

Dr. DAVID WALSH showed, on his own first finger, the site of a typical X-ray wart, which he acquired when using X-rays four or five years ago. He had now ceased to do such work, but while he was working at it he was very careful of his hands. His own was a "series burn."

Dermatitis herpetiformis of Unusual Type.

By J. GALLOWAY, M.D.

THE patient, a man, aged 23, describes himself as never having been in robust health, but physical examination discloses no obvious visceral lesion nor any signs of disease, with the exception of the condition to be described. In December last he had an attack of what is stated to have been influenza, the temperature rising on this occasion to 103° F. His convalescence seems to have been somewhat protracted. During the month of January he had an attack of gonorrhœa, from which he rapidly recovered, and which had completely disappeared by the beginning of April. During this attack he was at one time treated by the administration of sandalwood oil in capsules, and suffered in consequence from an erythematous eruption, which, however, seems to have vanished in the ordinary course. At the end of March he developed a few spots on the right forearm which he says was the commencement of his present disease. These spots are stated to have been red and slightly raised above the surface. He states that some of them showed slight blistering.

The eruption rapidly advanced till it attained its present extensive distribution. In the early part of May, the skin disease rapidly advancing, he was sent to Margate for the benefit of his health, and consulted Dr. John L. Sawers. During his stay in Margate the attack increased in severity, and on account of this Dr. Sawers communicated with Dr. Galloway respecting his condition. The acutest stage of this attack seems to have occurred during his stay in Margate. On returning to his home in Croydon he again came under the care of his usual medical attendant, Dr. Robert C. Brown, who also communicated with Dr. Galloway on account of the peculiar symptoms presented by the case. The patient was then sent to be under Dr. Galloway's care in Charing Cross Hospital.

The following note was made of the condition of his skin shortly after admission : " The eruption consists of dark erythematous patches distributed universally. It is most profuse, however, on the face, upper and lower extremities, and the upper portion of the trunk. The parts least affected are the anterior surfaces of the abdomen and thorax, the lumbar region of the back, which is practically clear, the hands and feet. On more minute examination the erythematous patches are found to be made up of rounded spots of purple red tint, from 25 mm. to 50 mm. in diameter, grouped in irregular corymbose areas. The patches so formed are from 2 cm. to 3 cm. in diameter, but tend to become confluent, forming larger areas of eruption. The individual small spots show distinct atrophy with a smooth, glossy surface. There may still be seen vesico-pustules, especially at the margins of the areas of disease. Here and there individual isolated spots may be noted. The skin disease gives indications of having originated throughout as a vesico-pustular eruption.

On admission the affected areas were thickly encrusted, partly, no doubt, owing to the formation of true epithelial crust, but mostly as the result of the concretion of dressings containing powders. On the face, especially the bearded parts, a slight dermatitis, eczematoid in character, was noticeable. The scalp is affected with the disease, but there is no indication of affection of the mucous membranes, with the exception of a slight amount of the eruption on the glans and preputium penis. A slight marginal blepharitis exists, apparently of secondary origin, and occasional slight conjunctivitis is observed, but it is not clear that vesicles form on the conjunctivæ.

The patient has been examined carefully to ascertain if visceral disease of any sort can be identified, but the results have been negative.

The urine, repeatedly examined, is normal; the blood, examined on July 10, shows the following state :—

Hæmoglobin	...	...	...	90 per cent.
Red blood-cells	...	...	...	4,890,000 per cubic millimetre
Leucocytes	...	...	...	6,000 per „
Polymorphonuclears	...	...	...	63·6 per cent.
Lymphocytes	...	...	...	6·2 „
Large mononuclears	...	...	...	20·8 „
Transitional	...	...	...	4·2 „
Eosinophiles	...	...	...	5·2 „
				100·0

There was a slight rise of temperature on admission to about 100° F., with widespread enlargement of lymphatic glands. These were most noticeable on the neck, where those in the neighbourhood of the sternomastoid were as large as filberts. They were, however, soft, and gave the impression of glands enlarged from septic absorption, which might easily be accounted for by reason of the crusted character of the eruption on the face and scalp.

The treatment made use of in the hospital was, first, the use of daily bran baths. The surface was then dressed throughout with a cream consisting of almond oil and lime-water. By this means the crusts were rapidly removed, the temperature falling to normal. The patient now had a bran bath daily, and was dusted from head to foot with a neutral dusting powder of zinc oxide and silicious earth, containing 10 per cent. boric acid. When shown to the Section the deeply congested and atrophic appearance of the eruption could readily be made out. It was apparent that the violence of the attack had ceased; no recent points of eruption could be seen. It was especially to be observed that no lesions of simple erythematous or urticarial character were noticeable, nor had they apparently occurred at any time during the disease.

Dr. Galloway drew attention to the unusual type presented by this case, although, no doubt, it could be grouped as an example of dermatitis herpetiformis. He drew attention to the fact that there was little or no pain, only a certain amount of general irritation; that none of the concomitant lesions of dermatitis herpetiformis (*e.g.*, urticaria and erythema) had been observed. The spots affected by the disease became universally congested; they gave rise to feeble vesication, the fluid becoming turbid rather than definitely purulent, and, when the epidermis

separated, the rounded spot of purple atrophic skin remained as the relic of the disease. This type of dermatitis herpetiformis in his experience was very unusual, and reminded him of the earlier descriptions of hydroa herpetiformis before Dühring's account of the disease became so universally accepted. Dr. Galloway hoped to receive suggestions from members of the Section as to any means of further investigation of this very severe and unusual condition. To his mind it seemed probable that the eruption was due to a cause, probably of internal origin, and in some respects might be regarded as analogous to the rare acute "exanthematic" outbursts of what had been called lupus erythematosus.

DISCUSSION.

Dr. COLCOTT FOX said that he had had the opportunity of seeing this interesting case previously with Dr. Galloway. The picture presented by the patient immediately brought to his mind one of the patients from whom Dr. Tilbury Fox had originally given the description of what he called hydroa herpetiformis. He considered that the case could well be classified under the heading of dermatitis herpetiformis, but the type was quite unusual and peculiar. He was glad to observe that the patient was so much improved in his condition since he had seen the case in Charing Cross Hospital with Dr. Galloway.

Sir MALCOLM MORRIS remarked that he considered that the fact that the disease before the Section consisted of lesions which were defined from the outset, showing no tendency to peripheral spread, was sufficient to make a clear diagnosis between the disease presented by the patient and cases of exanthematic lupus erythematosus. As to the causation of the present case he was especially interested to hear that an erythematous eruption had followed the use of sandalwood oil. The disturbance so produced might, he thought, be of some importance in the history of the case.

Dr. WHITFIELD said that at the present time, the violence of the eruption having become spent, suggestions as to immediate treatment were not necessary. He considered, however, that during the development of such cases the coagulation period of the blood should be carefully watched. He thought that it was quite possible that the damaging effects of the disease on the skin might be, at any rate to some extent, controlled by the use of lime salts according to the variations in the coagulability of the blood. Dr. Whitfield did not agree with the suggestion than any clinical analogy existed between this case and any of the types of lupus erythematosus.

Dr. GALLOWAY thanked the members present for their criticisms and suggestions in this case, and hoped that he might be able to take advantage of them in treatment. He especially desired to acknowledge the interest of Dr. Sawers and Dr. Brown, who had sent the case to him.

**Well-marked Rosacea associated with Phlyctenular
Conjunctivitis and Ulceration of the Eyes.**

By E. G. GRAHAM LITTLE, M.D.

THE patient was a man, aged 52, a carpenter by trade, and he had suffered from rosacea for five years; the exacerbations of this disease were usually accompanied by phlyctenular conjunctivitis. Both eyes were affected, the right more than the left. The case had been sent from an ophthalmic surgeon with a view to ascertaining whether dermatologists were as familiar with the association of eye affection of this type with rosacea as ophthalmic surgeons were.

Dr. WHITFIELD said he had frequently seen the association. The ophthalmic surgeon at King's College Hospital had drawn his attention to such cases, and had found staphylococci as a rule in the lesions of the eye, which usually improved coincidently with treatment for rosacea directed to remedying the dyspeptic symptom of that disease.

Case of Prurigo of Hebra.

By E. G. GRAHAM LITTLE, M.D.

THE patient was a foreign Jewish girl, aged 6. The affection had first been noted at the age of 18 months and had persisted ever since. The child was covered with the characteristic itchy papules of the disease, the whole body and face being involved. The papules were closely grouped, of the size of a small pea, and very irritable. On the arms and legs there was a secondary, very severe chronic pus infection. All the glands in neck, axilla and groin were greatly and visibly enlarged. The child was deeply pigmented, probably as a result of the itching, the mother being moderately fair. No other members of the family had the disease. The age at which the patient had become affected—18 months—was older than the majority of cases reported by Hebra and Kaposi, but it was certain that Hebra's prurigo sometimes commenced in later childhood. The exhibitor had recorded a case which began at the age of 6 years, commencing after an attack of scarlet fever, and other even later commencements had been reported.

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Dr. COLCOTT FOX said that he had been struck with the fact that, whereas lichen urticatus, which was sometimes regarded as the forerunner of Hebra's prurigo, commenced in the early months of infancy, true prurigo more commonly, in his experience, commenced later—at the age of 4 or 5 years. It remained, however, a very rare disease.

Case of Molluscum contagiosum.

By E. G. GRAHAM LITTLE, M.D.

THE case, one of perfectly typical aspect, occurred in a man aged about 35, with lesions confined to the pubic region of the abdomen and the penis, two molluscum tumours being found on the prepuce. There were about seven lesions in all, and the typical white waxy material had been extruded from the tumours and demonstrated microscopically. The exhibitor thought the distribution on the penis sufficiently interesting to record. No source of infection had been identified. Molluscum contagiosum was not a common disease in adults, and it was curious that in some parts of the country the disease itself seemed extremely rare; Dr. Arthur Hall, of Sheffield, had told the exhibitor that they had not met with a case in Sheffield for many years.

Dr. COLCOTT FOX said he had seen numerous cases of molluscum contagiosum in the children in the poor-law schools provided for ringworm, and the scalp was a very frequent position for the tumour to appear.

Case of Pityriasis rosea.

By E. G. GRAHAM LITTLE, M.D.

A VERY extensive and characteristic eruption occupied the chest, abdomen, back, arms and forearms, thighs and, what was extremely uncommon, the face. The latter part was covered for three-fourths of its surface with quite characteristic small circinate patches. The disease had commenced as an acute efflorescence eight days previously, and there was no history of a pioneer patch.

DISCUSSION.

Sir MALCOLM MORRIS drew attention to the unusual season of the year for pityriasis rosea to develop, but said he had himself seen quite an epidemic

of the disease recently. He pointed out the extraordinary similarity of the lesions on the forearms to a secondary syphilide; he had recently seen a case of pityriasis rosea involving the face, which he had at first regarded as possibly lupus erythematosus, considering the rarity of pityriasis rosea in this position.

Dr. WHITFIELD did not think the face was very rarely involved; he had seen more than one such distribution, and had found it on the scalp as well.

Two Cases of Congenital Syphilis with late Cutaneous and Mucous Membrane Lesions of the Gummatous or Phagedænic Type.

By J. H. SEQUEIRA, M.D.

CASE I.—Extensive Gummatous Ulceration of the Nose and Lip with Gummatous Hepatitis.

E. B., AGED 11, admitted to the London Hospital on June 18, 1908. The mother, a Russian Jewess, gave the following history: She has enjoyed good health. She has been married nineteen years. She has had ten children, of whom six survive. Her first and second children died within a few weeks of birth. The third child was still-born. The fourth child, a boy now aged 17, is in good health, and there is no history of any syphilitic manifestation. The fifth child died from measles at the age of 9 months. The sixth, a girl now aged 14, had some skin eruption when she was between 11 and 12 years of age. She shows no signs of syphilis. The seventh child is the patient now shown. The eighth child, a boy now aged 9 years, had "blisters" on his limbs when 2 or 3 years old. The ninth child, aged 5, had a "sore" on the roof of his mouth when 1 month old. The youngest child, now aged 3, had a rash all over the body and upper and lower extremities when one month old. The four younger children were examined, but no evidence of congenital syphilis was discovered. The father is said to have suffered from "ulcerated legs" a few years after he was married. No direct history of syphilis was obtainable.

Patient's History.—When 6 weeks old she had an eruption between the legs and around the genitals and buttocks. Vaccination "took very badly." The mother describes the vaccination spots as forming deep "holes" which took three or four weeks to heal. The child had some "inflammation of the eyes" when she was 2 years old, and after this

the abdomen began to swell. Tuberculous peritonitis was diagnosed, and she attended a dispensary for three years, being given ol. morrhuae and malt. At one time also some inunction, apparently of mercurial ointment, was prescribed. Two years ago (aged 9) a small lump appeared at the left inner canthus, evidently a suppurating dacryocyst. The abscess "broke," and has discharged more or less ever since. A little later the opposite lachrymal sac was similarly affected. One year ago nasal discharge began, and the mother describes the inside of the nose as "decaying and coming away." The discharge at this time was offensive and often blood-stained. During this period the nose became steadily flatter. The child at this time attended two hospitals, and was an in-patient at one for seven weeks. Six weeks prior to admission at the London Hospital the upper lip became swollen and ulcerated. The ulceration rapidly increased and the lip "split" on June 8.

[Dr. Sequeira acknowledges his indebtedness to his clinical assistant, Dr. W. G. Parkinson, for his care in obtaining so complete a history in very difficult circumstances.]

Condition on Admission (June 18, 1908).—The child is very anæmic and her face is terribly disfigured. The nose is flat, level with the cheek, and ulcerated. The upper margin of the ulcer has a serpiginous punched-out margin, suggesting the coalescence of three gummatous ulcers. The lower part of the nose is almost entirely eroded, and presents an ulcerated surface which is continuous with a huge ulcer on the upper lip. This extends the whole width of the nose, and presents one very deep and one smaller fissure, which split the lip up nearly to what would be the anterior nares. The surface is dirty yellowish brown, and from it and from the interior of the nose a most offensive sanious discharge is continually pouring. Both lachrymal sacs are suppurating, and pus exudes from two sinuses connected with each. There is no ulceration in the buccal cavity, and the pharynx and palate are free. The upper central incisor (left) is of the Hutchinson type. There is no interstitial keratitis, and no choroiditis has been made out on ophthalmoscopic examination.

Visceral Lesions.—The abdomen is enormously swollen, and huge dilated veins cross from it on to the thorax. The umbilicus is protruded. The liver is irregularly enlarged. Its lower margin extends in an irregular curve downwards from just below the margin of the ribs in the mid-axillary line to the umbilicus. On the left side the hepatic dullness is continued into that of the enlarged spleen. The surface of the liver presents large rounded bosses, which are obvious on inspection and

easily made out on palpation. The heart is pushed up, and the apex beat is nearly one costal space higher than normal. The spleen extends down to and a little beyond the umbilicus. Its surface is smooth to palpation. There is universal enlargement of the lymphatic glands, those in the groins, axillæ, and neck being easily visible, and on palpation of extreme hardness. There has been no albuminuria and no diarrhœa. There is advanced genu valgum on the right side.

The child has been kept in bed and given plenty of nourishing food. Mercurial ointment, 1 dr. *per diem*, has been rubbed in, and iodide of potassium, in 5 gr. doses, has been given internally. The nasal cavity has been irrigated with lotio nigra. The ulcers have been dressed with an ointment of peroxide of zinc (40 gr. to the ounce). Improvement has been extremely rapid, and when shown at the meeting, exactly four weeks after admission, most of the ulceration had healed. A remarkable feature has been the amount of repair, especially in the lip. The child will, of course, be terribly deformed, as a considerable part of the bony nose as well as the cartilage has been destroyed.

CASE II.—*Extensive Gummatous Ulceration Round the Mouth.*

T. H., aged 15 years, admitted to the London Hospital on June 29, 1908.

Family History.—The patient is the eldest of five children, the other four being girls. No details are obtainable as to their infancy, but so far as is known they have been in good health. No information is to be had of the health of the parents, the boy being sent from an institution.

Personal History.—There is no information as to the patient's condition in infancy, but until three years ago he states that he was well.

Present Illness.—The first manifestation was a "lump," which appeared on the middle of the right cheek three years ago. This "broke" and ulceration extended over the right cheek, as high as the outer canthus of the eye and inwards to the right side of the nose, involving the ala and part of the tip of the organ. On one occasion the area was scraped. The boy, who is intelligent, states that the ulcerated area healed up while he was taking medicine, and remained well for over a year. Three months ago a fresh outbreak occurred on the upper lip, and the ulceration spread round the left angle. One month ago a swelling appeared on the lower lip and this rapidly broke down into an ulcer.

Condition on Admission (June 29, 1908).—A large area of scar tissue extends all over the right cheek from the lower lid to the mandible, internally reaching the side of the nose, of which the ala and part of the tip have disappeared. There is extensive ectropion of the right lower lid, the result of the contraction of the scar. On the upper lip there are two foul ulcers covered with yellowish slough and with a yellowish sanious discharge. The ulcer on the right side extends from the angle of the mouth to near the middle of the lip. That on the left side starts $\frac{1}{2}$ in. from the middle line and extends along the upper lip, round the left angle in horseshoe form, and is continuous with a large ulcer on the lower lip, which reaches nearly to the right angle. The ulceration is partly of the skin and partly of the mucosa. It is everywhere about $\frac{1}{2}$ in. to $\frac{3}{4}$ in. across. Its edge is steep and irregular. The middle of the upper lip is swollen and everted but not ulcerated. There is constant dribbling on account of the condition of the lower lip, but there is no ulceration of the buccal cavity, or of the palate or pharynx. The interior of the nose, so far as it can be seen, is normal. There is a small opacity on the right cornea, but this looks more like the result of a corneal ulcer than interstitial keratitis. No choroiditis could be made out on ophthalmoscopic examination. There is a characteristic Hutchinson tooth (upper incisor, left). There is no evidence of visceral implication. The boy's general condition is good.

The patient was shown eighteen days after admission, and the ulceration had almost entirely healed. The treatment had been identical with that pursued in the other case.

Cases of this type of congenital syphilis are fortunately exceedingly rare, but the exhibitor had another under his care in September, 1907.¹

The importance of early recognition of this condition is obvious. In the first case shown the abdominal visceral disease was diagnosed as tuberculous peritonitis, and when the nasal and cutaneous lesions appeared they were considered to be lupus. A diagnosis of lupus had also been made in the second case. The fulminating character of the disease and the terrible deformity which so rapidly results call for early and energetic treatment.

It is of special interest to record that in both these cases Calmette's ophthalmic tuberculin test was tried, and in each instance there was no reaction. In the event of there being doubt as to the diagnosis between lupus and inherited syphilis this test is of value, as a positive reaction has always been obtained in lupus vulgaris.

¹ Described, with photographs, by H. Emlyn Jones, *Brit. Journ. Child. Dis.*, April, 1908, p. 144.

**Case] of [Primary Cutaneous Carcinoma of the Chest involving
the neighbouring Nerve Areas.**

By DAVID WALSH, M.D.

THE patient, H. M. M., aged 54, a clerk, was first seen on June 25, 1908, complaining of so-called "shingles," for which malady he had been treated by a medical man. Patient looked thin and anxious; said he weighed 10 st. 12 lb. (not enough for his height), and had lost 3 lb. weight in the last twelve months. His general health had always been good until eighteen months ago, when he was laid up six weeks with what he described as "a very bad heart." Six months later he noticed a hardness and red discoloration of the left nipple. This grew to the size of a hand, when he consulted a medical man, who said it was shingles. It had grown steadily ever since. There had been no pain except on one occasion, four months ago, when he was suddenly seized in the region of the liver with pain of a week's duration. Water formed in the abdomen, and he was tapped twice. There had been no return of either the pain or the dropsy.

On examination, a sheet of pink and red nodules, for the most part confluent, was seen on the left chest. In the left nipple line it reached from the lower border of the third to the eighth or ninth ribs with a vertical measurement of some 7 in. It extended across the lower part of the sternum, and at the right nipple line formed a tapering band of discrete nodules about 2 in. broad. Higher up on the right chest above the nipple were two small, recent patches, the highest at the level of the third rib. The nipples looked normal in shape and size, although the left was closely wedged in by a mass of nodules.

At the back the main sheet of eruption ends, about 2 in. behind the posterior axillary line. Three inches from the spine at the lower level of the main eruption is a group of discrete nodules, the size of half a crown, with a similar group some 3 in. higher up inside the angle of the scapula. Over the front of the left shoulder-joint is a group of firm sparse nodules about the size of a hemp-seed, while at the back over the long head of the triceps and beneath the deltoid muscle is a reddish patch, about 2 in. across, in which can be felt minute commencing nodules. In front of the middle of the left biceps is an irregularly bordered reddish macule, about the size of a crown, in which a slightly

nodular feel can be made out on careful palpation; on the inner side of the middle of the left upper arm is another similar patch, and a third in the back of the triceps.

The nodules vary in size from a millet-seed to a pea, and are of various shades of pink and lake colour, with a brownish tint in places. They are firm and movable, not tender on pressure, and have never been painful. About a week after coming under observation some small hæmorrhagic points appeared. A nodule the size of a split pea was excised, and a microscopic examination showed an alveolar stroma of connective tissue packed with epithelial cells beneath an unbroken epidermis.

The heart sounds were normal. Superficial veins of abdomen enlarged. Liver dulness about normal; somewhat enlarged area of dulness in splenic region. Patient has not complained of pain in abdomen (except during the single attack above mentioned), neither has there been any marked bowel disturbance.

A mass of hard glands can be felt in each axilla, somewhat larger in the left. Small hard glands can be felt both above and below the collar-bones, especially on the left side.

There are several points of interest in this case. The new growth, although it began at the nipple, appears to be not Paget's disease, but a lenticular scirrhus, apparently of primary cutaneous origin. If the fleeting pain in the liver and the dropsy four months since were due to secondary invasion the abdomen might be expected at this stage to show more marked evidence of involvement. The main interest, however, lies in the distribution and spread of the carcinomatous process in definite nerve areas. In the earlier stages the eruption was so characteristic of nerve implication that it was actually mistaken for an intercostal herpes zoster by a medical man. The main part of the eruption began near the nipple in the segment supplied by the fifth dorsal nerve, and now occupies the segments supplied by the third to the sixth dorsal nerves. The right front of the chest is becoming invaded in a corresponding area. The comparatively recent sites of invasion on the front of the shoulder-joint and over the biceps occur in areas supplied by cervical nerves. That on the inner side of the arm is apparently in the intercosto-humeral (third dorsal) region. It is not easy to imagine any growth of infection from the primary eruption to the secondary patches on the arm along lymphatic routes.

The whole case is of much interest in connection with Mr. Lenthal Cheatele's observations on inflammatory changes in posterior spinal root

ganglia in certain cases of cutaneous cancer. In the present instance the new growth presumably started in the cutaneous distribution of a single dorsal ganglion, but it now reaches the cutaneous distribution of neighbouring dorsal and cervical ganglia. The picture, viewed from behind, is specially suggestive of involvement of the posterior and lateral branches of dorsal, and, in the shoulder and arm, patches of cervical nerve.

Operation is clearly out of the question in a case of extensive "cancer en cuirasse" of this kind. On the recommendation of Dr. T. Shaw-Mackenzie, preparations of pancreas and intestinal gland are being administered by the mouth, with excess of sugar in diet.

Case of Fibromata of Skin with developing Neuro-fibroma.

By DAVID WALSH, M.D.

THE patient, H. G., male, aged 28, a Post Office worker, came on June 18, 1908, complaining of painless growths on front of chest and elsewhere of eight or nine years' duration. He says the growths appeared first at the time mentioned, and his mother is quite sure he had none as a child. Both the mother and one brother have similar growths on the arms.

On examination, a group of small, firm, thickly set movable subcutaneous nodules are to be seen on the right subclavian and sternal region. The surface involved measures about 3 in. by 7 in. The growths vary in size from a millet-seed to a split pea. They are painless, and there is no tenderness on pressure except in the largest nodule, which is about the size of a marrow-fat pea. This nodule is extremely sensitive to pressure, a tenderness that is definitely due to nervous causes and not to pressure irritation. A small group of a dozen or more small nodules is below the right shoulder-blade, one of them being the size of a pea. A few others in an early stage are near the angle of the left scapula. About the middle front of the left forearm is a linear transverse group of a dozen or so similar small nodules. In this place slight tenderness is felt on firm pressure upwards.

The distribution of the thoracic group is suggestive of a possible nerve origin. The one tender nodule further suggests the development

of a nerve element in the growth. The probability seems to be that the nodules are simple fibromata, but it is hoped to settle the matter by a biopsy.

Many members considered this case an example of multiple leiomyomata cutis.

Microscopical Specimen and Pure Culture of a Yeast derived from a case of Intertriginous Dermatitis of the Cruro-scrotal Region.

By A. WHITFIELD, M.D.

THE patient was an elderly gentleman, who had suffered from what appeared to be ordinary eczema intertrigo of the groins and perineum. No marked marginate appearance was present and no other symptoms suggestive of parasitic origin. Examination of a scale showed, however, that the horny layer contained an abundance of large round bodies, considerably larger than the spores of a trichophyton. Two scales from different parts of the eruption were planted on Sabouraud's ringworm medium, and on both tubes a perfectly pure primary culture of yeast was obtained. The urine had been tested but no sugar had been found. Dr. Whitfield said that he considered that the yeast was in all probability causing the dermatitis, since it was found in such abundance and active growth in the scales.

PROCEEDINGS
OF THE
ROYAL SOCIETY OF MEDICINE

VOLUME THE FIRST

COMPRISING THE REPORT OF THE PROCEEDINGS FOR THE
SESSION 1907-8

ELECTRO-THERAPEUTICAL SECTION



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The Council think it right to state that the Society does not hold itself in any way responsible for the statements made or the views put forward in the various papers.

Electro-Therapeutical Section.

October 25, 1907.

M. W. DEANE BUTCHER, President of the Section, in the Chair.

PRESIDENTIAL ADDRESS.

The Future of Electricity in Medicine.

GENTLEMEN,—I congratulate you on your presence here to-night on what I cannot help thinking is an historic event, the first meeting of the Electro-therapeutic Section of the Royal Society of Medicine, the first occasion on which electrical science has been represented in the Witenagemot of Medicine. It would be wearisome to recount the past history of electro-therapy, or to dwell on the troubles and indignities of its youth. Suffice it that the Electro-therapeutical Society has taken its place by its sister societies, and it is for us, as servants and votaries of medicine, to prove by zealous service our right to that place.

The subject of my address is the Future of Electricity in Medicine, the *rôle* which electricity is destined to play in the future development of the healing art. The first record of electro-therapeutic treatment was in A.D. 34, when, as Scribonius Largus tells us, patients suffering from rheumatism and gout were placed in a bath containing electric eels. Up to recent times the progress of medical electricity has been a slow one. But that progress of late years has been greatly accelerated. Seldom in the evolution of a science has such a rapid advance been made as that of Röntgen diagnosis and electro-therapeutic treatment during the last decade. I propose to trace briefly the general trend of this advance, and, from the direction of progress in the past, endeavour to predict the course of the future development.

RÖNTGENOGRAPHY.

And first as to röntgenography or skiagraphy: the impression of the shadow of internal structures on a photographic plate. Marvellous as is the progress since the appearance of Röntgen's original pamphlet, "Ueber eine neue Art von Strahlen," we are still far from having attained finality in this direction.

The Focus-tube.—The Röntgen tube itself is but a very imperfect instrument, the result more of chance than of design, and far from realising our ideal of a focus-tube—a fixed and unvarying source for the emission of ethereal undulations of definite wave-length and constant intensity. Some such tube as this I seem to see foreshadowed: an ethereal musical instrument able to give out and sustain without alteration of pitch any required note of the Röntgen gamut; able also, at the will of the operator, to run through the whole of the scale with any desired rapidity. We require a chord of Röntgen vibrations, the component notes of which will in turn bring out on the plate the softer tissues, the muscles, the arteries, and the bones. Something of this sort has been already accomplished. In the latest development, the plastic skiagraphy of Dr. Béla Alexander, a soft tube, the bass viol, as it were, is used in conjunction with a hard tube, the flute of the Röntgen orchestra. A practical advance in this direction would be the construction of a tube-holder similar in principle to the nose-piece of a microscope, which shall hold three or more Röntgen bulbs in such a manner that any one of them can instantly be placed in position over the diaphragm. By this means we should be able to switch on radiations of different penetration on the same plate during a single exposure. It is evident that any photograph showing a large amount of detail and differentiation of structure must be the product of a compound irradiation. This I believe to be the explanation of the supposed superiority of long exposures in skiagraphy. Radiographers giving a long exposure are, in fact, using a tube which is gradually getting harder, and is therefore giving out rays of ever-increasing penetration.

The Photographic Plate.—The photographic plate is susceptible of as much improvement as the focus-tube. The compass of the Röntgen scale may be greatly extended not only by using a more variable source, but also by increasing the sensitiveness of the plate which registers the vibrations. So the ripple-marks on the seashore are dependent not only on the magnitude of the waves, but on the fineness of the sand which receives their impressions. The improvement of the photographic plate offers an inexhaustible field to the ingenuity of the inventor. The present tendency seems to be to increase the thickness of the film and the density of the silver salts in the emulsion. Some operators even attempt to increase the absorption of the rays by using two plates placed face to face.

Development.—The development of the plate is a matter of almost equal importance. It is only an expert photographer who can attain

proficiency in the art of developing the host of superimposed lights and shadows which we call a negative. Let me explain. If I handle this piece of glass you know that the perspiration will leave on it an almost invisible impression of my finger tips. By appropriate means, the use of osmic acid, photography, and the like, we may obtain a permanent record, a detailed plan and figuration of this chance impression. All the lines of the finished picture were present in the original impression, though invisible, and any want of skill in the handling and subsequent treatment would have obliterated them completely. So in even the most imperfect Röntgen negative there is imprinted a vast amount of detail which may be brought out by careful manipulation.

Printing.—When the negative is developed we are still far from the end of our labours if we would get the very best results of which our art is capable. At the last Berlin Congress Dr. Béla Alexander showed how details and differentiation of invisible or barely visible shadows may be reinforced by repeated copying and recopying of the superimposed negative and diapositive. In this method, the so-called “Plastic Röntgenography,” the negative is first copied as a diapositive; the two are then superimposed with a very slight displacement, and a plate is made from this combination. To obtain a print this combination is copied once more, and the final print is made from this fourth plate. In some of Dr. Alexander’s later work every smallest detail of muscle and tendon, artery and vein, stands out with startling clearness.

As the length of exposure becomes shorter and shorter we may expect an extension of the use of reinforcing plates, whereby the exceedingly brief Röntgen illumination is prolonged by phosphorescence. The question of screening the plate from the effects of secondary radiations, again, is becoming of ever-increasing importance. In röntgenography for the detection of renal calculus and the like, the results may often be improved by placing a sheet of aluminium immediately over the photographic plate.

Time of Exposure.—In the future the time of exposure will certainly be greatly reduced. The lightning flash of X-rays will be allowed to act on the plate for only a fraction of a second. The enormous current necessary for this will probably be switched on and off again by a single motion of the key, so as to prevent its ever passing for a sufficient length of time to overheat the anticathode or to damage the tube. The exposure of the future must be instantaneous, not only with regard to the respiratory movements, but also when compared with the heart-beat. This is already quite within the bounds of possibility. I recently showed the

skiagram of a bullet in the pericardium, taken by Professor Rieder, of Munich. The absolutely round contour of the bullet shows that it was practically unmoved by the cardiac beat during the time of exposure.

Those who have seen the beautiful pictures produced by tele-röntgenography—skiagraphy at a distance—will agree with me that this method has before it a great future. Dr. Rosenthal, of Munich, has made some wonderful skiagrams by this method, which I hope to lay before you at a future meeting. In this procedure the focus-tube is placed at a distance of two or more metres from the patient. By this means the magnification of the shadow is greatly reduced and the distortion avoided. Tele-röntgenography will probably be used in the future to replace the more tedious processes of orthodiascopy and ortho-röntgenography.

At the Surgical Section of this Society, Professor Goldmann showed a somewhat novel procedure for obtaining the necessary differentiation of transparency in abdominal examinations. The procedure consists in blowing up the colon as far as the cæcum with air, previous to the Röntgen examination. By this method he has obtained most interesting skiagrams of calculi and concretions in the appendix. This is a method similar to that which has been in use for some time for the examination of diseased joints, where the necessary transparency of the joint has been obtained by injecting oxygen. The latter procedure is not without its danger, as one or two fatal accidents have been reported by German observers.

Compression.—I would draw your attention to one further point, and that is the *raison d'être* of compression. Compression alone does not increase penetration. The absorption of the X-rays is determined by the total amount of tissue traversed, not by the closeness of its packing. What compression does is to abolish air-spaces and increase the homogeneity of the tissue. Those who are familiar with the use of the fluorescent screen in the examination of the stomach will have been struck with the great increase of transparency obtained when the screen is brought into intimate contact with the abdominal walls, and a still further increase of clearness when pressure is used. This greater transparency is due to the greater homogeneity of the medium, and to the expulsion of air from the region immediately under the screen. A similar phenomenon is well known in optics. The transparency of a wetted cloth is due to its increased homogeneity and to the exclusion of layers of air. In order to obtain the best results the use of a compressor of some sort is absolutely essential. Some of the best results have been

obtained by using a pad of loofah under the compressor. In the search for renal calculus compression is not so important, since the usual position of the plate under the patient's body gives the two desiderata—viz., pressure and intimate contact. In examination of the apex of the lung, however, this is much more difficult of attainment. In order to compare the opacity of the apices of the two lungs, it might be possible to obtain a closer contact by means of an adherent photographic film. In the same way the fluorescent screen might perhaps be made of some flexible material, so as to secure complete apposition. Perhaps even it might be possible to paint directly on the skin a collodion film which shall be sensitive to the photographic or fluorescent action of the rays. These, then, are some of the improvements which we may fairly expect in the production and printing of that complex impression, a Röntgen photograph. This is not a simple record, but a most marvellous palimpsest, where shadow is superimposed on shadow, one record on another, in seemingly hopeless confusion, but each capable of yielding up its secret to the earnest and patient student.

Diagnosis.—In diseases of the chest, diagnosis by means of the Röntgen rays is rapidly developing. Röntgenography is destined to take its place beside, if it does not overshadow, the older classical methods. The Röntgen diagnosis of infiltrations of the apices of the lungs is already fairly advanced, and a very satisfactory instrument has been designed which enables us to compare the opacity of the two apices. What is of even greater importance is the possibility of diagnosing infiltrations of the glands of the hilus of the lung, a condition which is wholly beyond the ken of the older methods of diagnosis. It needs no prophet, therefore, to foretell that the future hospital or infirmary for diseases of the chest will be furnished with an X-ray installation as a matter of course. The same may be said of orthodiagraphy for diseases of the heart. In diseases of the stomach also a whole new field of research has been opened up by the labours of Rieder and Holzknecht, a field which we may rest assured will not be left untilled.

One of the most vivid impressions of my life was my first sight of the beating heart, like some living creature, tranquilly breathing within its bony cage. Still more impressive was the sight of the stomach during the digestion of a bismuth breakfast. The course of each mouthful during mastication and deglutition was visible on the screen, revealing as it passed the position of the œsophagus and the shape and movements of the stomach. The whole progress of digestion could be

followed, from the ingestion of the meal to the final passage of the food through the pylorus.

Even the cinematograph has been pressed into the service of medicine. At the last Berlin Congress the movements of the diaphragm and viscera during respiration were clearly reproduced on the lantern screen. If this is possible only a decade after Röntgen's discovery, what may not our successors hope to witness in the future? The differential diagnosis of various forms of arthritis, gout, rheumatism, and rheumatoid arthritis is well within our reach. Even now in some hospitals a Röntgen examination of the hands is a routine preliminary to the diagnosis of chronic disease of the larger joints.

Before I leave the subject of electricity in diagnosis, there is one of its possible uses which has been hitherto overlooked, but which I think might be of considerable utility. I allude to the employment of electricity during the preparation and staining of microscopic specimens. The demonstration of slight differences of structure, the enquiry into the penetration of external remedies, and the study of ionic cataphoresis may best be carried out in the field of the microscope. It would be interesting to know what is the exact effect of a weak galvanic current or of the X-rays on the staining of a microscopic specimen. In the early days of the Röntgen rays they were used commercially in the operation of tanning leather. It is quite possible that some interesting facts as to skin structure might be obtained by careful experiment on the ionic penetration of the skin under the influence of X-rays or radium.

Pathology.—I have no time to do more than glance at the use of the X-rays in anatomy and pathology. In anatomy the tedious process of dissection to trace the blood-supply is now replaced by a series of Röntgenograms of a suitably-injected organ. In pathology, also, specimens of the blood-supply of the neoplasm and its influence on the glands can best be examined by injection and röntgenography.

ELECTROTHERAPY.

We must now turn our attention to electrotherapy—the application of electricity to the treatment of disease.

Radium.—And first with regard to radium, for radium-therapy may fairly be included within the scope of electrical treatment, if we accept the modern theory that electricity is but the displacement of electrons. There is no fundamental difference between the natural radioactivity of radium and the artificial radioactivity of the anticathode of an X-ray tube. There is no more interesting phenomenon in medicine than the

withering of a wart, a lupus nodule, a rodent ulcer or a patch of epithelioma under the influence of radium irradiations. All embryonic or rapidly growing neoplasms are apparently destroyed with equal facility, provided they are sufficiently circumscribed and surrounded by healthy tissues. Could we but discover the *raison d'être* of this action we should perhaps have the key to nature's own method of cure. Do radium and X-ray irradiations act by direct bacterial destruction, or do they only awaken the resistance of the affected tissues? It would seem that an invaded tissue possesses three lines of defence—the first, hyperæmia, a flushing of the invaded area with lymph; the second, pigmentation, a screening of the organism from malign radiations; the third, an increased production of connective and scar tissue. All these phenomena may be observed in the integument which has been exposed to radium or to the artificial radioactivity of an X-ray tube. In the early days of radiotherapy, when the X-rays were used much more than they are now for hypertrichosis, one found again and again that the hair bulbs were strangled by a reticulated growth of connective tissue. After a long series of irradiations the face became smooth, pale, polished, and cold, and this without any visible X-ray reaction. The curative action of X-rays and radium on cancerous and other neoplasms appears to depend greatly on this stimulating action on the protective growth of scar tissue.

Röntgentherapy.—With regard to röntgentherapy, the most important point is the question of dosage. A recent paper by Rieder, of Munich, emphasises the importance of exceedingly small doses of Röntgen rays. It is now known that in cases of leukæmia an intense and prolonged irradiation may even have a deleterious effect, even though it results in a cure from a hæmatological point of view. Formerly it was the custom to continue the irradiation until the leukæmia had completely abated. Rieder advises that the treatment should be intermitted as soon as there is a decrease in the number of leucocytes. The first sign of leukopenia is a contra-indication of further X-ray treatment. He obtains the best results from single irradiations of five minutes' duration at intervals of one or even several weeks. The same observation applies to the treatment of struma, Basedow's disease, and the various skin diseases. I myself have insisted again and again on the efficacy of small doses, and shown that there is hardly any of these affections, be it chronic eczema or acne, psoriasis or sycosis, which is not benefited by small doses of the Röntgen rays.

As to the bactericidal action of the rays, no one who has watched

the cleansing of a foul varicose ulcer by the X-rays can doubt that they are bactericidal *in vivo*, whatever they may be *in vitro*, or on a culture plate. It may be that the effect is not directly bactericidal, but consequent on local hyperæmia. The efficacy of Bier's "Stauung" treatment seems to indicate that an abundant supply of lymph is the chief factor in nature's mechanism of healing. If this be so I know of no means of producing this limited and localised hyperæmia more certain than radium or X-ray irradiation. Whatever may be the rationale of the Röntgen cure, there is certainly an increasing tendency to give smaller and less frequent doses than in the early days of radiotherapy. Most observers are now agreed that any visible and intense reaction should be avoided. We have other more efficient and less dangerous means of producing destruction of tissue or cauterisation. It is seldom necessary to proceed even to epilation.

Ringworm.—It may, indeed, be doubted if Sabouraud's epilation method is the last word to be said in the treatment of ringworm. Parents and practitioners alike are somewhat chary of subjecting very young infants to so potent and powerful an agent, the action of which is so obscure and the ill-effects of which are so occult and so long delayed. In the future I believe that epilation will be reserved for older children or for inveterate cases only. It is, moreover, somewhat unscientific to root up the wheat in order to destroy the tares, when we have such a discriminating agent as the X-rays at our command.

At the Berlin Congress, Forstling, of Hanover, read a paper on "The Ill-Effects of X-ray Irradiation on Development," and showed a puppy, one of whose legs had been exposed to ten minutes' Röntgen irradiation when it was eight days old. The limb was permanently dwarfed and withered. It is true that, as Holzknecht has pointed out, the development of a young animal is much more rapid, and therefore more easily inhibited, than that of a child. Moreover, the skull of the infant will filter out some of the softer or more deleterious rays. But even so, the observation is not a pleasant one, and should give us pause. The ill-effects, if any, caused by irradiation of the child's nerve centres would be recognisable perhaps only after the lapse of years. On the other hand, I believe that small doses of Röntgen rays are of considerable utility in the treatment of ringworm. The method of introducing the copper ion by electrolysis also bids fair to be of great utility. The chief disadvantage is on the score of pain to the little patients, but this may be obviated in great measure by the simultaneous introduction of the cocaine ion.

This question of the penetration of the copper or mercury ion under the influence of the X-rays, high frequency, and the galvanic current, might easily be set at rest by suitable experiment. A couple of small pedunculated fibromata on the same patient might be treated with ointment or lotion containing a copper or mercury salt. One of them should then be irradiated or otherwise treated electrically. Both should then be examined under the microscope, with suitable reagents, to determine the depth to which the metallic ion had penetrated. Better still, a limb that has been condemned for amputation might be made the subject of experiment. Each finger or toe should be massaged with an ointment of oleate of copper. One finger might then be exposed to Röntgen irradiation, another to high-frequency *effluve*, another to the galvanic current, and so on.

High Frequency.—We have but little time to linger on the other modalities of electric treatment. High-frequency treatment has of late been receiving more attention in England. There seems to be no doubt that auto-conduction and auto-condensation are valuable means of reducing high arterial tension. The rapidly changing magnetic field appears to set up a sympathetic vibration of the electrons. According to the rapidity and wave-length of this vibration, it may cause either stimulation or inhibition of the nerve centres. It is possible that the same frequency of vibration may cause inhibition of one nerve centre and stimulation of another. In this way we might obtain simultaneous stimulation of the vasodilator and inhibition of the vasoconstrictor centres. The very marked action of high-frequency currents on the kidneys and on the urinary secretion is probably also due to the direct stimulation of the vasodilator centres.

It is surely unscientific to attempt to taboo high-frequency treatment because it has claimed too much and been used, perhaps, for unworthy purposes. The same may be said of any method of treatment, and, indeed, of all human activities. The opposition in England and Germany to d'Arsonvalisation, as it is called, has aroused the ire of a French writer, who speaks of it in words which are applicable not alone in France. "I speak," he says, "to the body of medical men who work, who desire to know, and whose brain is not curdled by dull routine. *Le reste ne compte pas.*" As students of electro-therapeutics we cannot afford to neglect any of the modes of motion of the electrons, the gentle flow in the galvanic current, the sudden rise and fall of velocity in the faradic current, or the lightning rapidity of high-frequency vibrations. A high-frequency apparatus, however, is a dangerous weapon in ignorant

hands. It is not a plaything to be entrusted to an inexperienced operator, be he qualified or unqualified in a legal sense. Only recently I had an opportunity of seeing the dangerous results of a high-frequency application in an unsuitable manner. The case, one of cardiac debility, was treated by stimulation with a glass excitor over the solar plexus. As might have been expected, it resulted in a considerable fall of blood-pressure, accompanied by weak pulse and great exhaustion. It has always been a matter of amazement to me how practitioners undertake the management of these powerful instruments with the gay *insouciance* of ignorance. The most important advance in electro-therapeutics will be the adequate instruction of the practitioner in the use of such lethal weapons. It is difficult to believe that the practitioners of the future will undertake so grave a responsibility as the application of X-rays and high frequency with so little preparation and so small a stock of physical knowledge.

Ions.—One of the most interesting developments of electric treatment is that of ionic medication, or ionic cataphoresis as I should prefer to call it. It may be noted in passing that the time-honoured treatment by internal medication, the introduction of drugs *per vias naturales*, is in reality ionic medication; since, as Van t'Hoff and others have shown, a weak solution consists of already dissociated ions. Internal medication is, therefore, ionic medication. Again, the old-fashioned galvanism with copper electrodes was in reality ionic cataphoresis. The pure effect of a galvanic current is almost unknown, since even with a carbon electrode and a thick pad of absorbent wool moistened with distilled water we cannot get rid of the action and caustic properties of the hydrogen ion. The successful treatment by ionic cataphoresis requires the most careful technique, perfect cleanliness, and as many precautions as does surgical asepsis.

The chief obstacle to further progress in this direction is the difficulty of producing sufficient ionic penetration without excessive pain or injury to the skin. There are two precautions which are of the utmost importance in ionic treatment—one is the absolute steadiness of the current, and the second is the very gradual rise and fall of potential when switching the current on and off. The first of these, the avoidance of accidental fluctuations in the current intensity, is absolutely impossible when using the public electric mains. A much better method is to use a battery of storage cells for all galvanic and ionic treatment. In repeating the experiments on electric sleep, Dr. Louise Robinovitch found that the sleep was much more tranquil and profound at Nantes than at Rome,

so much so that she imagined the difference must be due to variations in the physiological susceptibility of different breeds of rabbits. Subsequently she found that in the former town the current was obtained from storage cells, whereas in the latter the laboratory was supplied direct from the public mains.

Of equal importance is the gradual and imperceptible rise and fall of the current intensity. In ionisation or electric stimulation the pain is not caused by the intensity of the current, but by the variations of intensity. One of the instruments that we most need is an automatic contrivance for gradually turning on the current, increasing it very slowly, and turning it off again with equal precautions. Such a contrivance should not be difficult to design, and I commend it to the notice of the mechanical members of this Section. In ionic cataphoresis, also, the question of dose is of the utmost importance. Take, for example, the zinc ion. With the introduction of small ionic doses of zinc there is an increase of the vitality of the skin, as evidenced by the accelerated growth of hair. With large doses we get paralysis of the function of the skin and mortification of the tissue. It is curious to note that the lesions due to the introduction of metallic ions greatly resemble those produced by the X-rays, and exhibit a similar phenomenon of latency. This observation, which is due to Leduc, may throw some light on the cause of X-ray burns.

Electric Sleep.—Professor Leduc's recent work on electric sleep has opened up a magnificent and far-reaching vista. It has given us the means of producing sensory and cerebral inhibition. In the future an intermittent current of proper frequency may be at our disposal, by means of which we can at will switch off any, or all, the nerve centres one by one. Perhaps the Section will permit me to quote from an editorial on this subject which I wrote for the "Archives of the Röntgen Ray," and which has created a certain amount of interest in the German press:—

In the armamentarium of medicine there is a good array of weapons for stimulation, but comparatively few instruments for inhibition. Professor Leduc has given us a sleep-compeller, acting, not by poisoning, or counter-irritation, or exhaustion, but by the direct and immediate inhibition of the brain-cells themselves.

The inhibition is produced by an electrical stimulation of the nerve-cells, with a rhythm which is incompatible with their physiological activity. To produce the inhibitory effect the current oscillations must be in tune with the physiological note. The frequency for the brain of the rabbit is 100 per second, and the current duration one-thousandth of a second. Quietly,

without a cry or movement, without the least sign of pain or discomfort, the animal sinks into a condition of deep narcosis, similar to that produced by chloroform. On the cessation of the current the animal awakens instantly, without any sign of pain, or fear, or of fatigue.

Professor Leduc has subjected himself to the treatment with no ill-effects, although in his case the experiment was not carried far enough to produce complete narcosis.

Not only can general anæsthesia be produced, but by appropriate modifications of the process a limited local anæsthesia is also obtainable by this method. We are thus furnished with a most potent instrument for producing nervous inhibition, and we may hope ere long to see the electric sleep in use as a practical remedial agent, replacing or reinforcing the natural rest. More than this, we have some reason for supposing that each muscle and nerve is attuned to its own special period of electric stimulation, and therefore of electric inhibition, so that in the near future we may be able to put to sleep a tired member or an injured organ without obliterating the general consciousness.

The necessity of finding some safe and simple means of inducing nerve sleep is becoming ever more important as the stress of civilisation increases, and the prevailing disease—a too widely extended and developed consciousness of our environment—becomes more acute. We may live to hear “two hours’ inhibition” prescribed before an operation, or a “week’s electric sleep” before an examination. The possibility of thus suspending growth and tissue changes is brought forcibly to our notice by the modern methods of forcing vegetables and flowers for the market. In the vegetable as well as in the animal world, the axiom holds good that a period of quiescence or inhibition must precede a period of stimulated growth. The winter sleep of plants may be induced at any season of the year by placing them in cold storage, and plants whose growth has thus been retarded will develop much more rapidly on being reawakened by warmth. More recently the ether narcosis of plants has come into use. By this method a brief nap of some couple of hours seems to fulfil all the purposes of a long winter sleep, and the plant can be forced at once into a new season of growth and activity. It would be a marvellous addition to the forces at our disposal if we had some similar means for regulating the development and activity of the animal organism, and perchance the electric sleep may enable us to procure the inhibitory rest required as a prelude to stimulated growth.

At all events, we may expect great developments in the electrical treatment of neurasthenia and brain affections, since Leduc has shown not only that the brain itself is within the domain of electrical treatment, but that total inhibition of the cerebral function may be produced by the mere pressure of an electric switch.

Theory.—We may look forward to great progress in electrical theory and a clarification of our ideas as to the *rationale* of electricity, as the result of the epoch-making discoveries of the last few years. The

electron theory is so beautiful and so simple that we can only hope that the physicist will leave it alone as it now stands. For us who endeavour to visualise the passage of electricity through the human body, it is no small matter to have replaced the vague conception of an electric current by the mental picture of a double train of moving ions.

It is a most fascinating theme this—the future of electricity in medicine. But my time and your patience are both exhausted. In concluding, let me congratulate the members of this Section on having chosen this, the most interesting and stimulating of all branches of medicine. We stand on the utmost verge and boundary of things, where the coast-line which separates the known and the unknown is shifting most rapidly. For us is the supreme satisfaction of watching, and, in some measure, assisting in this transformation. For us the whole past of medicine is full of inspiration; for us the future of physical and electrical science teems with the very embodiments of our most sanguine dreams.

Dr. LEWIS JONES thought the President's survey of the whole subject of electrical therapeutics had been a very admirable and suggestive one. He had lately been greatly interested in the question of the penetration of ions. All investigators desired to discover how far into the tissues it was possible to cause ions to penetrate by means of the electric current, and whether they could be made to penetrate to any considerable depth. After consultation with chemists who, he thought, were able to illuminate the subject, he found the general opinion was that if the ion which it was desired to drive in was one which would form insoluble salts with the chemical constituents of the body, it would most likely combine in that way, and be put out of action at a comparatively slight depth, and could not then be made to penetrate any deeper. The initial velocity with which the ions moved on leaving the electrode and while passing through the epidermis was due to the fact that at those levels they had to carry the whole of the current concerned; but within the tissues these ions formed only a small proportion of a very large number of other ions, all of which were available for the conduction of the current. One might compare the condition to a stream of water running out of a small pipe into a river, where the velocity of the flow inside the pipe and just outside its end was rapid; but as soon as it became merged in the general stream of the river the velocity of the little stream would disappear. Zinc or copper ions within the tissues must meet with phosphates, and must almost

certainly form insoluble phosphates of zinc or copper, and cease to share in the transport of the current, the current from the positive pole being subsequently taken on by the other kations of the body, such as sodium, potassium, &c. For these reasons he thought it was unreasonable to expect that copper or zinc ions could be conveyed very far into the body. He thought it would be wise for electro-therapeutists to limit their attention for the present, when dealing with ions of the heavy metals, and to concentrate their efforts upon the treatment of quite superficial diseases, of which there were many requiring improved forms of treatment. On the other hand, with an ion like salicylic acid, which did not form insoluble compounds with the juices of the body, one might hope to cause penetration to take place to deeper levels. The difficulty remained, however, which he had previously mentioned, namely, that when the ions had passed away from the electrode their velocity of movement became diminished.

Dr. HORACE MANDERS, in dealing with the subject of the travelling of ions, said he imagined that they would follow the law of inverse squares, and therefore, following out that law, that they would not get very far into the body. The President had referred to the subject of electro-therapy and the brain, and in that connection he knew that X-rays had a very great effect in epilepsy, as he had treated one or two cases very successfully. Two or three years ago he gave particulars of the cases in the *Archives of the Röntgen Ray*. He followed the method of finding out where the aura started from, and irradiating the locality in the brain to which it corresponded with short exposures fairly frequently, say two or three times a week. He gradually increased the length of the intervals, but not the length of the sittings. The cases had done remarkably well; in one case a young man who had had constant *petit mal*, and was no good for any work in life, was now conducting quite a large farm and had not had a fit for a year. Personally he believed there was a very large future for X-rays in epilepsy. He did not claim that the method of treatment was original, but the plan of ascertaining the portion of the motor tract corresponding to the apparent point of origin of the aura, and irradiating that particular portion of the brain, was an idea of his own.

On the motion of Dr. LEWIS JONES, seconded by Mr. C. R. C. LISTER, a cordial vote of thanks was passed to the President for his Inaugural Address, which the President briefly acknowledged.

(The meeting was adjourned to November 22 next.)

Electro-Therapeutical Section.

November 22, 1907.

Dr. H. LEWIS JONES, Vice-President of the Section, in the Chair.

The X-ray Diagnosis of Renal and Ureteral Calculi.

By G. HARRISON ORTON, M.D.

GENTLEMEN,—So much has now been written on the subject of the X-ray diagnosis of renal and ureteral calculi that I owe, perhaps, some apology for introducing the subject before this Section of the Royal Society of Medicine. I cannot hope to introduce much, if anything, that will be new to the bulk of those present. Nevertheless we still have much to learn before this method of examination becomes perfect, and I trust that the few remarks I have to make this evening will lead to an interesting discussion, which may help us towards the solution of some of the chief difficulties we have to encounter. I shall confine my remarks, therefore, chiefly to my own experiences, and leave it to others to give theirs.

For convenience I will adhere as closely as possible to the order in which the various points are printed on the agenda.

First, then, under the heading of Technique, a few words as to the *preparation of the patient*. I do not think sufficient attention is as a rule paid to this point. I prefer all patients to be prepared much in the same way as for an anæsthetic, so that the intestines are as empty as possible at the time of examination. There are two chief reasons for this. In the first place, when a soft tube is used, fæcal masses certainly cast definite shadows. In the great majority of cases these shadows do not present any difficulty in the way of diagnosis, but I have seen at least two cases lately in which there were shadows quite definite enough for some forms of calculus in patients not properly prepared. These have entirely disappeared after an aperient and enema. Further, should the patient be taking certain drugs, such as bismuth, very dense shadows may be cast. These, although perhaps not in themselves likely to be mistaken for calculus, may form a shadow sufficiently dense to mask one. An interesting case of this sort, with a reproduction of the skiagram, was published recently by Mr. Thurstan Holland in the

Archives of the Röntgen Rays. Certain compressed drugs also, such as some forms of Blaud's pill, which have been found hard enough to be hammered into a deal board after having passed through the entire intestinal tract, might give shadows difficult to explain.

Again, after evacuation of the intestines, the colon, as a rule, is found to be filled with gas. This acts much in the same way, though to a less extent, as the artificial introduction of air, whereby a clearer differentiation of the abdominal contents is obtained. Under such conditions it is often possible to obtain an outline of the normal kidney, such as could hardly be expected were the stomach and intestines loaded. Naturally the more differentiation of soft parts we can obtain, provided always we can interpret their shadows, the more data we have to go on when trying to decide the position of any given shadow.

Position of Patient.—I prefer when possible to work from below, and the following is the method I usually employ. The patient, having been suitably prepared and clothed (I need hardly mention the importance of the absence of buttons, &c., in the clothing), is placed face downwards on a canvas-topped couch. Immediately below the ribs and under the abdomen is placed a sausage-shaped air pillow, especially made for this purpose, and I believe first introduced by Mr. Reid. The chief advantages of this pillow are as follows: (1) It acts as an efficient compressor, whereby the movements of the diaphragm are much restricted, so much so that a calculus remains practically stationary during ordinary respiration. This can easily be verified by anyone watching the shadow of a renal calculus on the screen. When the pillow is not in position it can be seen moving up and down, with a range in some cases of quite $1\frac{1}{2}$ inches on deep respiration, whereas with the pillow properly adjusted the movements can hardly be detected. The negatives obtained in this manner also demonstrate this point. If we consider the distance of the calculus from the plate, which in itself is the cause of some indistinctness of the shadow, it is evident, from the slight amount of blurring even after a longish exposure, that the kidney may be considered practically stationary.

Another important point, to my mind, is that the arch of the spine is obliterated by this method to a much greater extent than in any other method I know of, and consequently the plate can be approximated much closer to the region under examination.

Lastly, the presence of the bag does not in any way interfere with the passage of the rays. In fact, I have often noticed that more detail can be made out on the screen when the bag is *in situ* than when it is not employed. In addition to the compression obtained by the

weight of the patient, I myself always supplement this when it can be borne in the following manner: I have had made a wooden frame, over which parchment is stretched, and of such a size as to just take a 12 inch by 10 inch plate. This is attached to a frame which slides in grooves on each side of the couch. The frame is lowered on to the back of the patient, and when as much pressure as can be borne is obtained, it is clamped in position by a turn of two thumbscrews. It is a recognised fact that the X-rays, after passing through the body, produce secondary rays in the air. These tend to produce a fogging effect on the plate, and I am convinced that it is an important point to have the plate pressed as close to the body as possible. Of course the pressure can be obtained in other ways, as by placing sandbags or other weight on the top of the plates, but the method I have described is, I think, more certain and convenient. Moreover, in stereoscopic work the plates are quickly and easily changed, without any disturbance of the patient. By adopting this method I find that the movements due to respiration are in the majority of cases so slight that it is not necessary to give multiple exposures while the breath is held at the same phase of respiration. There are, however, some cases where it is still an advantage to do this; there are many pros and cons with regard to this question which I hardly have time to go into at present.

The focus-tube should be enclosed in an opaque box, which can be moved freely in any direction under the couch. The opening in the top of the box, through which the rays emerge, should be provided with a diaphragm the aperture of which can be easily altered. There should also be a means of centring the tube so that the normal ray may pass through the centre of the opening in the diaphragm.

Not the least advantage in working from below is the fact that one is enabled to obtain a view of the region to be examined on the screen before placing the plate in position. I attach a good deal of importance to this, for after considerable practice one is enabled to judge to a great extent from the appearance seen on the screen whether or not the tube is working to the best advantage for each individual case, and moreover valuable information as to the probable time of exposure required may also be obtained by this means.

Working from Above.—I have tried many forms of compressor for working with the tube above the patient. Most of these are clumsy and difficult to manage, and I now have discarded them for the method just described, which offers certain advantages not obtainable when

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working from above. In my hands, at all events, the method from below has given better results. In cases, however, where the patient cannot be examined from below, then some form of compressor must be used. In this case it is essential that the apparatus be rigid, and provided with a diaphragm to cut off secondary rays. The method of taking a large number of small plates, as adopted by Mr. Thurstan Holland, is hardly practicable in a large and busy hospital department, and I question whether any great advantage is obtained.

The X-ray Tube.—To obtain negatives of the required quality, as soft a tube as possible should be used, for it is only a tube with low vacuum that will give a good differentiation of the soft parts. A hard tube does not have the same effect on a photographic plate as a soft one, and a good black-and-white negative cannot be obtained, the result, even after prolonged exposure and careful development, being a dirty grey. I may here, perhaps, quote from a paper I read at the Exeter meeting, and give the opinions of others who joined in the discussion at that time. At the Röntgen Society a short time ago the question was raised as to whether a plate could be over-exposed when acted upon by the Röntgen rays. No definite conclusion was arrived at. I think I am right in saying that with a low tube and heavy current over-exposure is certainly possible. In the course of the discussion Dr. Howlett said: "I have come to the conclusion that it is not possible. The exposure can be prolonged indefinitely, and development will still give a good result. My opinion is that exposure cannot be too prolonged under ordinary conditions." No other speaker gave a further opinion on this point. I, however, am convinced that over-exposure is possible. The negative which I now show you is one of the renal region of a stout patient who was sent to me a short time back. The spark gap of the tube was about 3 inches, or slightly under; the current, $4\frac{1}{2}$ to 5 milliamperes through a Bauer air-cooled tube. The exposure was two minutes. The next negative is from the same case, with the same tube, and an exposure of fifty seconds. The development of the first negative was four minutes, and of the second ten minutes, with the same strength of solution. If this negative is not over-exposed, what has happened to it? Negative 3 is a specimen of an intermediate stage, but in a different subject. I do not believe that a negative of such a character could be obtained with a high tube. My contention that low tubes gave results superior to those obtained by high ones was supported by Dr. Morton, Mr. Lyster, and Dr. Arthur.

Mr. Shenton did not agree, and said: (1) "I question whether great

density is really wanted in negatives from the surgeon's point of view." With this I agree, but it is not necessary to obtain *great* density with a low tube. I maintain that you can get *more* density, with a correspondingly greater differentiation of soft parts, than is possible with a high tube. Moreover, with a high tube it is quite possible that a small calculus of low atomic weight, such as pure uric acid, would be entirely overlooked, owing to the greater penetrative power of such a tube. (2) "I have some radiographs taken with high tubes, and the negatives are of the washy character familiar to all X-ray workers, yet I find it possible to correct them in the printing process." I fear that negatives obtained with low tubes, too, are often thin and washy, especially in stout subjects; but even when thin they show, I think, more differentiation of soft parts. This skiagram is very thin. The subject is a man, 14 st. 3 lb. in weight, but as you see it shows a marked differentiation of soft parts; the edge of the psoas, outlines of the colon and other shadows of soft parts not easy to interpret are distinctly visible, and there is not that uniform grey appearance seen in a negative obtained with a high tube. (3) "In my opinion low tubes, in order to give these high densities, are not needed; we can do quite well with the tubes we have got." Now, to my mind, the X-ray tube is at present a most imperfect piece of apparatus, and I would rather say, considering the tubes we have got, we do not do so badly. Some may be satisfied with their results, but I venture to think that there are many, including myself, who are not so satisfied, and will work away until still better results can be obtained. Judging from the vast improvements in the results of the last few years, I am inclined to think that the day when perfection will be the rule rather than the exception is not so far off. I believe personally that it is to improvements in the X-ray tube that we now have to look before we can hope for much better results, and the improvement will be in the direction of a better control over the vacuum and the possibility of keeping the required vacuum constant during the exposure necessary to obtain the best results. I know of no tube at present with a spark gap, say, of $2\frac{1}{2}$ inches that will stand even a current of 4 milliamperes for a minute or two without getting too low to be of value. There are coils to be had giving an output capable of smashing any tube on the market. What we now want is a tube that will stand the increased output now obtainable.

I have no doubt that during a single exposure the quality of rays emitted by any given tube varies, and the tendency of a tube, if it does not get too hot, is to rise: that is, give off more penetrative rays. I

believe, too, that a low tube becomes higher when extra current is forced through it. Now, although a negative giving marked differentiation of soft parts is probably the result of a composite irradiation, I do not think it need necessarily be so, and I do not think that this is necessarily the reason why a somewhat prolonged exposure gives better results than very short ones. The results obtained in the thicker parts of the body by giving a second or two exposure with a very heavy current, at least such as I have seen, are certainly not superior, and I do not think equal, to those obtained by moderate currents and about fifty to sixty seconds exposure. Nevertheless I believe that if we could get tubes with a spark gap, say, of 2 to 2½ inches, that would stand these heavy currents for a sufficient length of time, we should be on the road to being able to get certain results even in the heaviest individuals. I have obtained results good enough to give a negative diagnosis in persons up to and somewhat over 14 st. in weight, but in a friend of mine who weighs over 19 st. and who was kind enough to lend me his abdomen to experiment with, although I was able to get a faint image of the spine I quite failed to get any attempt at differentiation of the soft parts. No tube I possessed would stand sufficient current for a sufficient length of time. At present, then, I believe that for this class of work there is no advantage in using very heavy currents for the reasons stated. I was talking the other day to a doctor from America, who had been using currents of 60 to 70 amperes in the primary of a coil which gave an enormous output (not measured, however), and he told me that except for getting a flash exposure of the chest he had given up using such heavy currents, as the results in the thicker part of the body were inferior to those obtained by moderate exposure and current. I understand that the same conclusion has been arrived at by German workers. The excellent results obtained by Dr. Charles Lester Leonard, of Philadelphia, in the X-ray diagnosis of renal and ureteral calculi are well known to most of you, and as a further support of my contention that low tubes are necessary I may quote from a paper published by him in the *Lancet* (June 17, 1905), in which he says:—

I insist upon the following features of my technique as producing accuracy, and I believe that a disregard of them by other operators accounts in a measure for their lower percentage of calculi found in the total of cases examined. . . . The first essential of technique is the employment of a constant quality of Röntgen ray, the penetrating power of which is so low that it will not penetrate the least dense calculi. The negative diagnosis was established upon the axiom that where shadows of tissues less dense than the least dense calculus

are shown no calculus should escape detection. The recognition of a negative as possessing these qualities and its proper translation are essentials of technique. The quality of X-ray employed has been given off by a tube the relative resistance of which, as measured by a parallel spark in air, was from $1\frac{1}{2}$ to 2 inches. The tube must be capable of maintaining itself during the entire exposure at the same vacuum. Many tubes, and tubes of higher vacuum, often vary in penetrating power, so that the light at one time during the exposure penetrates the smaller calculi.

The Screen Examination.—The screen examination is useful, as I have already stated, for gauging whether or not the tube is working to the best advantage in each individual case; it may be useful in confirming shadows seen on the photographic plate in some cases, since a very large number of calculi can be made out on screen examination, provided the luminous sensibility of the observer is at its maximum. This can only be obtained by remaining in the dark or semi-darkness for some time before the screen examination is made, and it is a point to which not sufficient attention is paid by many who wholly condemn such an examination, which undoubtedly has a sphere of usefulness. It must not be forgotten, too, that the eyes of different individuals vary in their ability to appreciate the fluorescence of the screen, and there are some who never can, even after a long time in complete darkness, observe details which are very evident to others. Constant practice, also, enables the eye to see more than that of those who do not so practise. For giving a *negative* diagnosis, however, I consider the screen examination absolutely valueless, for there are some shadows which appear quite distinctly on the negative which cannot be seen on the screen even when their exact position is known. I have tested this in all cases I have examined in the last six or seven months, and have found two in which distinct shadows were found on the plate of small calculi (since confirmed by operation), which by no stretch of the imagination could I see on the screen, even with a small diaphragm contracted round the area where the shadow was known to exist.

Under this heading I may mention a further use to which the screen has now been put. I refer to the examination of the kidney at the time of the operation. This has now been rendered quite practicable with the aid of the sterilisable cryptoscope designed by Mr. Reid, which it will be unnecessary to describe in detail; suffice it to say that the whole apparatus can be completely sterilised. The chief difficulties I have found in using it at present are the following:—

(1) When working in a light theatre it takes some time before the eyes can accommodate themselves to seeing objects on the screen, and

surgeons, as a rule, are not patient enough to keep their eyes glued to the machine for a sufficient length of time ; further, the eyes of the majority are not trained to screen work, and consequently they take more time, even under favourable conditions, to see what is at once apparent to an expert. This difficulty might be got over in the following way : (i.) If the radiographer present were to wear smoked glasses and were allowed to examine the kidney after delivery from the wound, his eyes would be in better condition to see the fluorescence of the screen, and his experience would enable him to decide quicker ; (ii.) or the theatre might be provided with dark blinds, which could be drawn at the proper time ; (iii.) or the operation might be performed in the evening, when one's luminous sensibility is always at its best.

(2) The eye-pieces of the present instrument do not entirely cut off the light, and the ease with which an eye-bath fits the eye has suggested to me that if the eye-pieces were made in this shape they would cut off the light more efficiently.

Lastly, there is a difficulty in some cases of getting the kidney sufficiently far out of the wound, but I have no doubt this is much facilitated by the weapon which Mr. Reid has now designed to help this procedure, and of which at present I have had no experience.

There can be little doubt that when this instrument is more generally known it will be much used, and gradually improvements will suggest themselves. For it cannot be denied that it is a great advance over the cutting and needling all over of the kidney, with a great possibility, even after this has been carefully done by a skilled surgeon, of a small calculus being overlooked.

And now as to the value of the X-ray diagnosis of calculi. It is my belief that every renal calculus, at any rate of sufficient size to warrant surgical interference, no matter what its composition, is capable of being demonstrated by the Röntgen rays, provided a certain quality of negative can be obtained. The same holds good with regard to ureteric stones, with, perhaps, the one rare exception of small uric acid calculi being in such a position in the pelvis that their shadow is obscured by that of the bones. I mean in such a position between the bracket in this negative, which is one of a normal pelvis.

We now come to a very important point, namely, the interpretation of the various shadows seen on the negative, and first of all I want to show you a slide of one case which is typical of many similar I have seen. The shadows are apparently normal, but are ever so much more prominent in some cases than others. I will simply show it and

ask those present to give their opinion, in the discussion to follow, as to what they are due. Are they the shadows of the normal kidney?

The number of cases in which a negative of the required character cannot be obtained is, I am glad to say, in the hands of skilled operators becoming gradually less, but there are still some few cases which, owing to the thickness and density of the individual, render the production of such a negative impossible; in such cases a negative diagnosis cannot be given. I mention density as well as thickness, as some individuals appear much more opaque to the rays than others of a similar weight and size. Here again it is only the expert who is able to judge the required character of negative, but it should show a marked differentiation of soft parts; the edge of the psoas and transverse processes of the vertebræ should certainly be visible, and if the outline of the kidney, divisions of the colon, &c., can be made out, so much the better, but I certainly would never give a negative diagnosis on a plate which did not show some differentiation of soft parts. There are some who maintain that it is not necessary for the transverse processes of the vertebræ to be seen, but I am sure that this is quite wrong, for how can we expect to find a small uric acid calculus, which is less dense than bone, if bony points themselves cannot be distinguished? I now show you several negatives which I consider are of such a quality that a negative diagnosis with regard to the regions they represent can be given with some degree of certainty, and this one shows conclusively the possibility of showing the outline of the normal kidney. In the two cases published by Mr. Clement Lucas (*British Medical Journal*, October, 1904), under the heading, "Two cases of Renal Calculus, in which the X-rays failed to indicate the presence of a stone," I feel sure that, either through faulty technique or density of the individual, satisfactory negatives could not have been obtained, in which case this ought to have been explained, and no opinion given. One of the cases, however, gives a point for discussion. The patient was a thin man, the stone was a large branching phosphatic stone immersed in pus, and it is suggested that the pus masked the shadow of the stone. This is contrary to my experience, and I should much like to hear the opinion of others.

The negative I now show you is from a case which was operated upon only this afternoon. The calculus which I have here, as you see, corresponds exactly in size to the shadow; it is composed of phosphates and carbonates, and was in the pelvis of a kidney which contained 3 or 4 oz. of very thick pus (Pl. I., fig. 1). You see also a minute

shadow to the outer side of the larger one; this proved to be a minute calculus no larger than a millet seed, which shows quite clearly in spite of the presence of the pus.

I may here again quote from Dr. Leonard's paper: "The accuracy which has been demonstrated for this method by clinical experience has led me to hold that the negative diagnosis, when proper technique and skill have been employed and a *satisfactory plate* has been obtained, is of such accuracy that surgical interference with the purpose of detecting calculi is unnecessary and not justified." In his series of 330 cases the total amount of error in both the positive and negative diagnosis was less than 3 per cent. "This is a percentage of error that compares very favourably with any other method or all other methods of diagnosis, including exploratory nephrotomy." I am spending a little time over the subject of the negative diagnosis because I am convinced that too much importance cannot be attached to it, and it is important from the physician's as well as from the surgeon's point of view. There are a great number of cases of oxaluria and phosphaturia which present symptoms so strongly resembling calculus conditions that medical treatment would be scarcely justified unless a decided negative diagnosis could be given. To be able to give such a diagnosis not only may save the patient from an unnecessary exploratory operation, but justifies the continuance of treatment by medical measures. The fact, too, that renal calculi may produce albuminuria without other symptoms, and that such cases have been mistaken for chronic interstitial nephritis and other forms of kidney disease, must not be lost sight of. So much for the negative diagnosis. We will now go on to consider the positive diagnosis, or the interpretation of negatives which show definite shadows.

I have mentioned that all calculi met with in the urinary tract throw shadows when exposed to the Röntgen rays; the intensity of the shadow, as you know, varies with the size and composition of the stone, uric acid being the least opaque, but casting quite a pronounced shadow if a low tube be employed (Pl. I., fig. 2). The three most important groups of substances found in calculi are uric acid and its salts, calcium oxalate, calcic and ammonio-magnesian phosphates, while other substances such as calcium carbonate and cystine,¹ which latter casts a shadow much denser than uric acid, are occasionally met with, and of course each stone may be a combination of two or more of these substances. I do not think, therefore, that with the exception, perhaps, that a

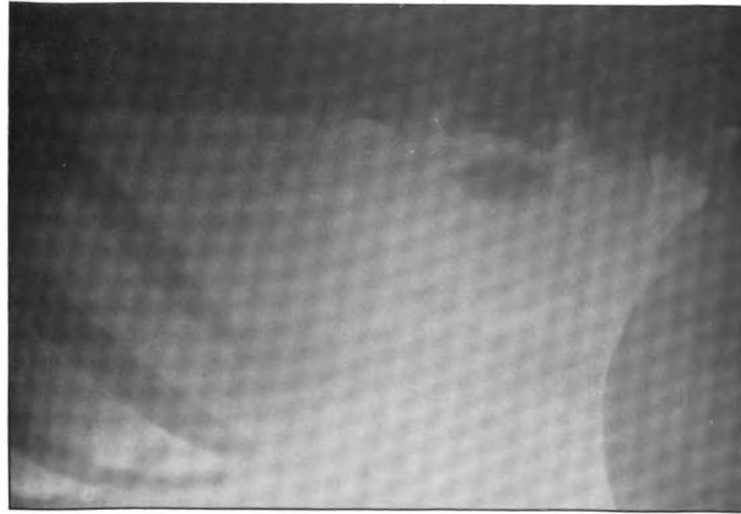


FIG. 1.

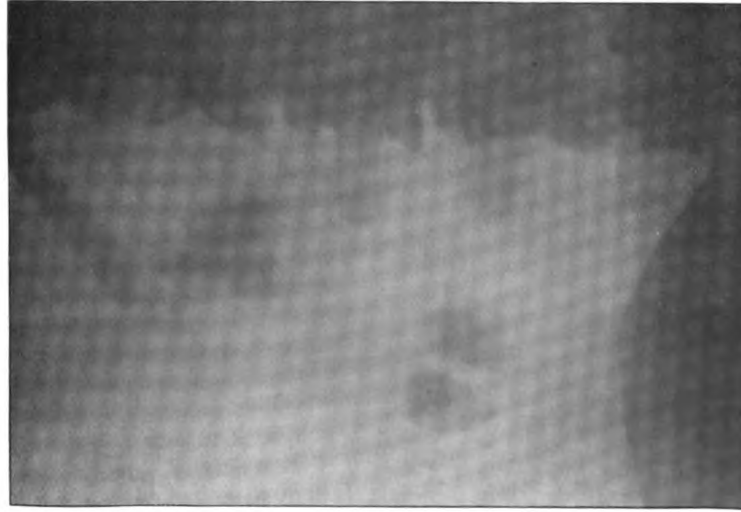


FIG. 2.

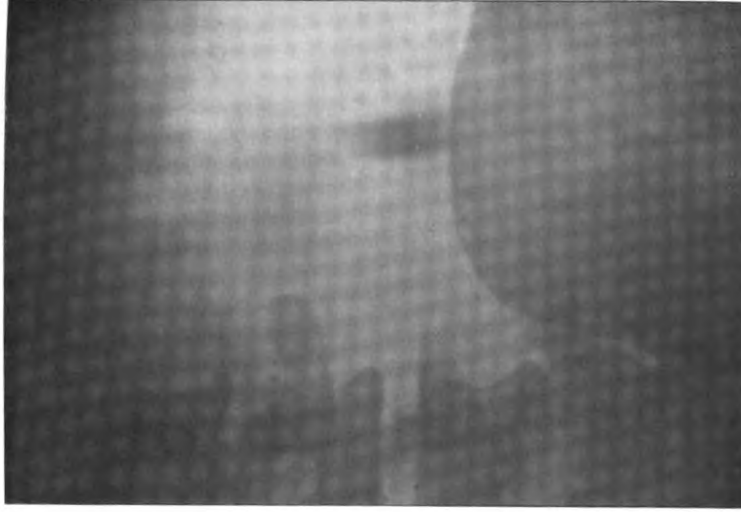
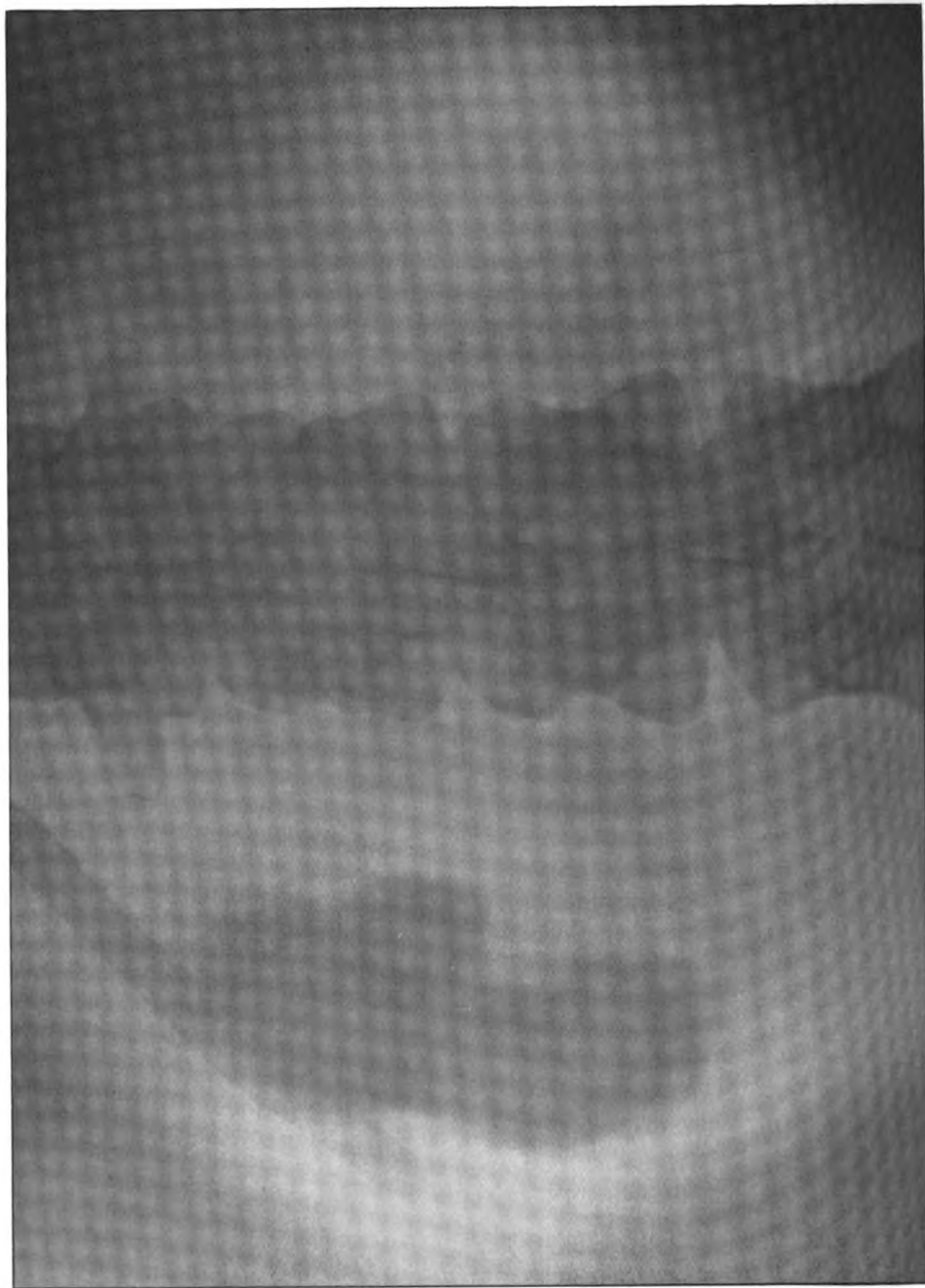


FIG. 3.



ORTON: X-ray Diagnosis of Calculi. Plate II.

very faint shadow is suggestive of uric acid, any opinion as to the composition of a calculus can be gleaned from the *density of the shadow*.

A caseous kidney may cast a shadow quite as dense as that of a calculus (Pl. II.). In the negative I now show you, the shadow which you see is due to caseous material containing lime salts, and I certainly thought this was due to calculus until the operation proved me to be wrong. The negative also again shows the value of a low tube, for although the patient came to me bearing a note to the effect that it was feared she was too stout for an X-ray examination to be of value, you will see that what proved to be a cyst at the lower end of the kidney casts a distinct shadow, and also that not only the psoas but distinct fasciculi in this muscle are easily made out.

From the *shape of the shadow*, however, some help may be obtained. Small calculi in the kidney are often irregular in shape, and present no distinctive features, though they tend to assume gradually the special forms obtaining among the larger varieties. Thus a large stone in the pelvis of the kidney often possesses irregular projections corresponding to the openings of the calices. Such forms often give distinctive shadows, which are quite diagnostic. Small stones in the ureter have as a rule sharp borders and a more or less oval shape. A large and irregular shadow in the true pelvis, even though it lies apparently in the track of the ureter, is probably due to other causes than ureteral calculus. Stones in the bladder are generally round or oval; there are exceptions to all these rules, however, so that we cannot place too much reliance on the shape of the shadow.

Next as to *the position of shadows*. Shadows of renal calculi may be found as high up as, and be overlapped by, the last rib, as in the case I now show you. On the other hand, they may be as low as is shown by the next slide—that is, below the iliac crest. Both these cases have been confirmed by operation. It was thought that the shadow in this last case, although rather far out, might possibly be due to stone in the ureter, and the sterilisable cryptoscope was in readiness at the time of the operation. On exposing the kidney, however, which was in a somewhat lower position than normal, the stone could be distinctly felt in the lower part, and was easily removed. It was of a flat circular shape as shown by the shadow. Shadows may appear in any position between these two extremes, as in the next two slides (Pl. I., figs. 2 and 3). Now, although shadows of calculi in the ureter may be in any part of the ureter, it is a matter of experience that they are generally found low down in the pelvis. Should they be higher up—and Mr. Hurry Fenwick has published a

case in which a small oxalate stone was found 3 inches below the right kidney—the shadow is always closer to the spine than that of a renal calculus. The three great features of ureteric stone are, as stated by Mr. Hurry Fenwick, “that they are in the line of the ureter, their outlines are sharp, and that their shapes are more or less oval.” Now the line of the ureter is quite close to the spine. It crosses the transverse processes of the lumbar vertebræ to enter the pelvis as a rule rather to the inner side of the sacro-iliac synchondrosis. You will see that the shadow in the skiagram I have just shown of a calculus below the level of the iliac crest is well to the outer side of the synchondrosis, and therefore the probability would be that, unless the ureter was in an abnormal position, such a shadow must be outside the ureter. This, as I have already said, was proved by operation to be the case.

Let us now consider the fallacies due to other conditions which produce shadows simulating those of calculi, and how they may as far as possible be avoided. And first a few general points which apply to all cases.

(1) The shadow or shadows should be present on at least two plates, obtained from two separate exposures. Never give an opinion on a shadow which appears on one plate only. Defects in the plate or errors in development may produce appearances which are very deceptive. This was very forcibly brought home to me a short time ago. A plate was shown to me with some glee by a friend who was somewhat sceptical as to the value of the X-ray diagnosis of calculi. I was told that the plate showed a marked shadow of a stone, that an operation was performed, that no stone was found, or any other condition which could account for the shadow. On looking at the plate it was evident that this was no stone at all. It was a very thin, poor negative, with no differentiation of soft parts, but the shadow of the supposed stone was most marked, and as dense almost as if a piece of lead had been put on the plate. I should think it was possibly due to a drop of fluid having got on the plate before development. No confirmatory plate was taken, and, as I have said, the patient was subjected to operation. It is such defective technique and inexperienced interpretation of shadows which tends to bring the method into disrepute.

(2) The impossibility by ordinary clinical methods of making a differential diagnosis between stone in the kidney and stone in the ureter in many cases makes it absolutely necessary that the whole urinary tract on both sides should be examined in every case, before a patient can be pronounced to be free from stone.

(3) All the facts of the case should be taken into consideration. This method cannot be expected to produce the best results when used alone; but, used in conjunction with other recognised methods of diagnosis, it adds an accuracy and precision obtained by no other means.

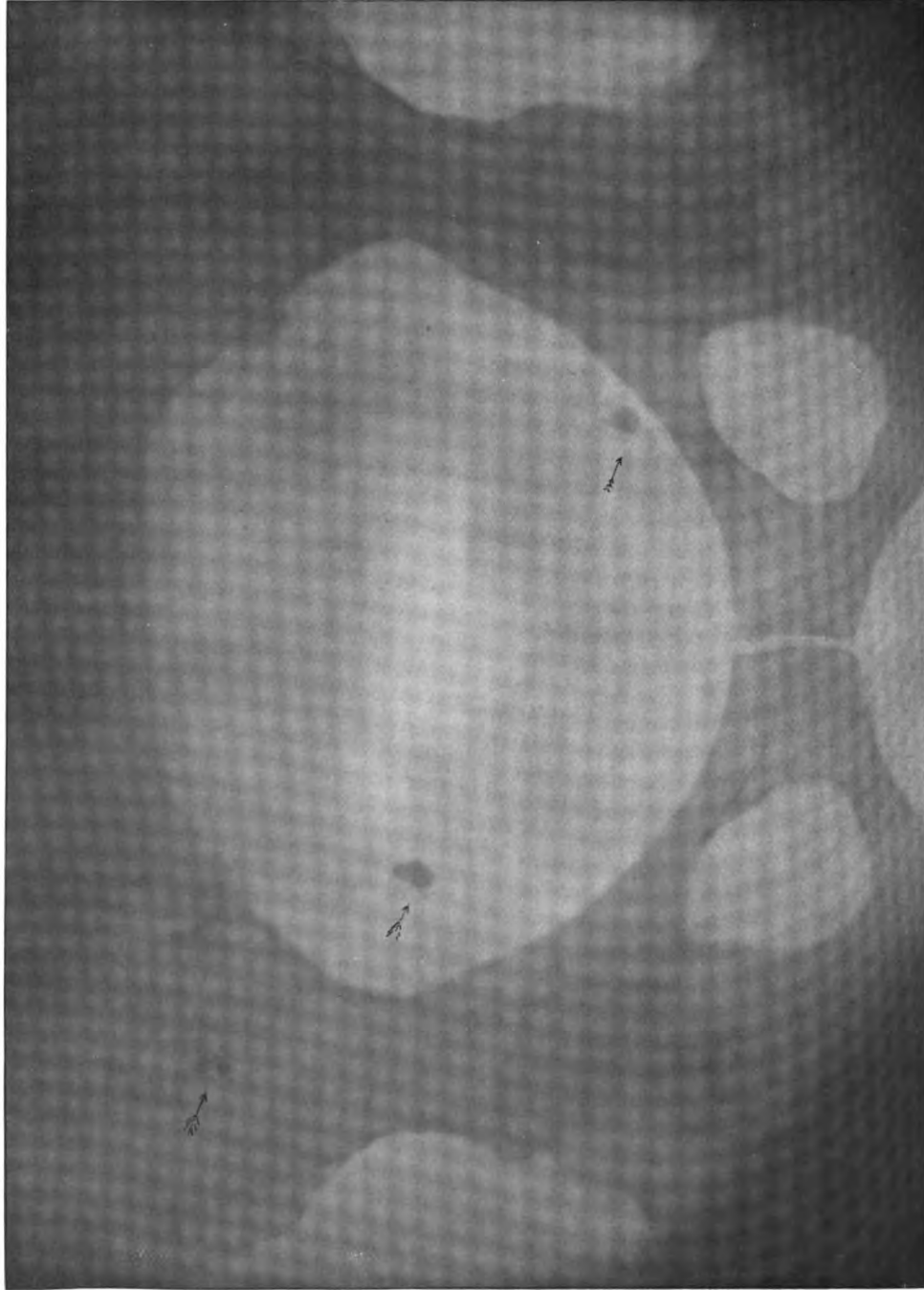
We will, now take one by one, and discuss briefly, various conditions which may lead to error.

The most confusing, perhaps, are the shadows cast by *calcified mesenteric glands*. These may appear in any part of the urinary tract, and may take various forms and shapes. Some of these, from their distribution and irregular shape, make us at once suspicious of their character. There are others, however, which it may be almost impossible to distinguish from stones in the lower ureter. In such cases, the passage of a shadowgraph ureteric bougie, as suggested by Mr. Hurry Fenwick, is, I think, undoubtedly the best procedure. The bougie is passed into the ureter, and a skiagram is then taken. The bougie casts a dense shadow, and the relation of the suspicious shadow to the bougie can thus be determined. I have here some illustrations published by Mr. Fenwick in the *British Medical Journal* which show the value of this method. It is not always infallible, however. I know of one case in which a calcareous gland surrounded, and by pressure completely blocked, the ureter. The bougie would have passed up to this, and of course it would have been in the line of the ureter. Again Mr. Thurstan Holland has lately published a case (*Archives of the Röntgen Rays*, August, 1907), in which a calcareous gland was found adherent to the ureter, and in the ureter at the same spot was found a tiny calculus. Nevertheless there can be little doubt that in certain cases this procedure may be of great assistance.

Phleboliths, especially in the pelvic veins, are not infrequently met with. Two cases were published in the *Lancet* (June 15, 1907), by Dr. Harris, of Sydney, in one of which an operation for ureteral calculus was performed. The shadows, however, were found to be due to "shotty" bodies outside the ureter. The shadowgraph bougie would have probably settled the question in this case. Again, the very small size of the shadows would have warranted a course of expectant treatment, during which time a careful watch on the signs and symptoms would probably have given valuable information. Before the introduction of the Röntgen method expectant treatment in many cases was not warranted, owing to the impossibility of deciding whether the symptoms were due to renal, ureteral or extra-ureteral conditions. If a careful X-ray examination of such cases be made,

however, and negatives of the *required character* show only a small shadow, probably due to a small calculus low down in the ureter, expectant treatment is certainly in many cases warranted, for experience has shown that in quite a fair percentage of such cases the calculus is eventually passed—twenty-six out of forty in Dr. Leonard's series. Such treatment must, of course, be carried out under strict supervision. The negative I now show you is one in which I believe the shadows may possibly be due to phleboliths, though again they may be due to calcification in a gland. As you will see, they lie very near the track of the right ureter. On the other hand, there are two side by side. These do not look like stones in the ureter, and there are no symptoms pointing to renal or ureteral trouble. This patient is perfectly well, with the exception that she has persistent œdema of both feet and legs. She was X-rayed with a view to determine whether anything could be found which might be exerting pressure on the common iliac veins, as she was rather too stout for satisfactory examination by other means. These two shadows I have confirmed on three different plates, and the position just opposite the intervertebral substance between the fourth and fifth lumbar vertebræ, although perhaps rather far out, is suggestive, especially when taken in conjunction with the symptoms of some organised thickening obstructing the flow at the junction of the common iliac veins. Possibly they may be due to calcification of glands exerting pressure on these veins. The shadows can only be obtained by using a very low tube, and it is difficult to maintain such a vacuum without its falling too low during the exposure. On a negative obtained with a high tube no trace of these shadows could be seen.

So great has been the improvement in technique during the last few years that even small *calcareous patches* in an atheromatous vessel are now capable of demonstration. These may in some cases cause confusion, so that really the chief difficulty now is not in finding a shadow, but in interpreting those we are able to obtain. The next case I show you will demonstrate how plainly thin calcareous flakes can be shown even when embedded in a dense structure. This patient, by no means small or thin, was sent for an X-ray examination of the renal region, and the shadows you now see were obtained and confirmed. I gave it as my opinion that they were calcareous flakes in a hydro- or pyonephrotic kidney. An operation was performed and the kidney removed. By the kind permission of Mr. Berry, who performed the operation, I now show you the kidney itself, which has been preserved



ORTON: X-ray Diagnosis of Calculi. Plate III.

in formalin. You will see how very dense it is and how very thin are the small calcareous flakes.

The slide which I now show you is a somewhat interesting and unusual one (Pl. III.). The patient had several apparently quite definite attacks of appendicitis. The surgeon, before undertaking the operation, wished to exclude renal and ureteral calculi, for, as you are aware, the differential diagnosis between these two conditions is often very difficult, and a healthy appendix has on several occasions been removed when the real cause of the trouble was ureteral stone. This, then, is what I found in the pelvic region of this patient. You will see there are three distinct shadows, two on the right side and one on the left. The two on the right side are of such similar density that I believed them to be due to one and the same cause, and I ventured to suggest that they were concretions in the appendix. The one on the left side is not so dense, and is in a position in which I have seen similar shadows on several occasions, and several have been published which might almost be duplicates of this, so similar are they in shape and position. I do not know to what they are due, and I know of no published account in which the mystery has been solved. This print shows another similar shadow in another part of the pelvis, discovered quite by accident, in a patient examined after a fall from a bicycle. But to return to the two shadows on the right, the patient was operated upon and the appendix removed. It was found to contain nine small shots about No. 5 or 6, but was otherwise healthy. I have no doubt now that the lower shadow is composed of a group of five or six shots, and the upper shadow of three or possibly four, for on close examination certain circular shapes, due to individual shot, can be made out. The position of the lower shadow is very suggestive of stone in the ureter, and the two together are interesting as pointing to the regions in which shadows of *concretions in the appendix* may be expected to be found, and the necessity, therefore, of bearing this possibility in mind when endeavouring to interpret shadows in this region.

Lastly, certain conditions, such as *warts on the skin*, are capable of casting confusing shadows. Dr. Lewis Jones has an interesting negative showing a shadow due to such a condition. No doubt by the stereoscopic method these might be shown to be outside the body, but as a routine I do not think that the stereoscopic method affords much help in the abdominal region. Since, however, it is necessary to take at least two negatives, this method might just as well be employed; it gives some idea as to the depth of the shadows from the

surface, but gives nothing like as much information in these cases as in joint conditions, where I have found it quite invaluable. It has its sphere of usefulness, however, and not the least is the fact that two somewhat thin negatives, when superimposed by the stereoscope, reinforce one another, so to speak, and often enable one to see more detail than when either is viewed separately.

I have no time now to more than mention the fact that, in localising small shadows in the pelvis, the introduction of air into the bladder may be at times of great assistance, as by this means the outlines of this organ can be distinctly made out. This slide is of a large vesical calculus, and you will notice that the outline of the bladder in this case is distinctly visible without this procedure, probably due to hypertrophy of its walls. The artificial introduction of air into the intestines, as advocated by Professor Goldmann before the Surgical Section of this Society a few weeks back, may prove of valuable assistance in some doubtful cases, especially in thick individuals where the abdomen is very dense, but at the present I have had no experience of this method.

My thanks are due to Sir Dyce Duckworth, Dr. C. C. Gibbes, Dr. Mary Scharlieb, Mr. Donald Armour, Mr. James Berry, Mr. Lockwood, Mr. Roughton, and others, for material furnished by cases under their care.

DISCUSSION.

Mr. A. D. REID said : I congratulate Dr. Orton on his paper. He has covered the ground very carefully, and detailed his own and other methods of procedure. I quite agree with him with regard to the greater value of the low tube. There is not the slightest doubt that a high tube is a source of error, particularly in diagnosing the more transparent calculi. The difficulty, of course, is to maintain the tube at its proper vacuum, for it runs down so quickly, and frequent changing is very annoying. With regard to exposures, I have tried in turn the mercurial and the electrolytic break, and have found that with the latter, while the exposures were shorter, the results were not anything like so good. I have now gone back again to the mercury interrupter, and am inclined to come down from the quick exposures. I have made several experiments with what may be called the American methods, but do not obtain such good results as with the mercury break and the longer exposure. By the former methods I have occasionally been able to obtain an outline of the bone in from one to two seconds, but generally speaking the negatives are inferior to those obtained by other means. I found the breakage of the water-cooled tubes to be too expensive, particularly when the results were so indifferent. With regard to the "cryptoscope," I have already shown at one of our meetings the weapon or special retractor that Dr. Orton has referred to. It is simply an aluminium plate with a hole in the centre, and when the kidney is drawn out from the body, it is passed through this hole, and the tissues around

the kidney are depressed. By this means it is possible to see the pelvis of the kidney and the upper part of the ureter. I have only used it in three cases, and in each case the stone has been extracted with an incision not exceeding an inch in length. The stones were all single ones. The shadows in the neighbourhood of the lower end of the ureter are a great difficulty and bugbear. I thought that I had got to the end of them when a new shadow appeared which completely baffled us all. It turned out eventually to be a calcified fibre depending from the ureter. The shadow was quite a large one, being about the size of the biggest ureteral calculus I have seen. [Mr. Reid showed lantern slides, illustrating some points in Dr. Orton's paper, particularly with regard to the shadows at the lower end of the ureter.]

Dr. W. IRONSIDE BRUCE, after thanking Dr. Orton for his exceedingly interesting paper, said: Dr. Orton mentioned that he had had difficulty in keeping the tube from getting lower during lengthy exposures. I would draw his attention to a possible method of doing this. I have been very much impressed by the fact that if one is working with a focus tube the equivalent spark-gap of which is less than 3 inches, the glass of the tube becomes very hot and the tube is lowered. I believe the lowering of the tube to be largely due to the heating of the glass. If it were possible to oil-cool the glass we might be able to pass a much larger amount of current for a longer time. With regard to the length of exposure, I entirely agree with Dr. Orton that as a rule the best results are gained with the longer exposures. Another point insisted on was the necessity for a considerable distance between the focus tube and the plate. The tube should be a considerable distance from the plate, because it is obvious that the further the tube is away the sharper will be the definition. In my work at the hospital, while the distance is altered according to the condition of the patient, it is never less than 22 inches. The advantage in sharpness more than compensates for the extra time wasted. I aim at producing the outline of the kidney in every case. The information that is obtained from a negative in which the outline of the kidney is visible is very great. It is then possible to say in what relative position the stone is to be found, and this is very important, from the surgeon's point of view, for it makes it possible to remove the stone without splitting the kidney. With negatives of this description Mr. Clogg, of the Charing Cross Hospital, has been able to remove the calculus from the kidney without any splitting whatever. In a case in which stone has been found in a kidney, it is very important also to diagnose the size and condition of the other kidney. With regard to differential diagnosis in suspected tuberculous kidney, it is necessary to observe the relative size of the kidneys, and if one of them is enlarged, this fact, taken in conjunction with the presence of pus in the urine, may be held to point with certainty to the evidence of tuberculosis. I should like to ask whether the skiagrams have been taken in the same position with regard to the vertebræ in every case.

Dr. C. THURSTAN HOLLAND said: Dr. Orton's paper has interested me from so many points of view that it is impossible to enter into them all, but perhaps a little of one's personal experiences may be of service in a discussion of this

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kind. I use a 220-volt current, with one of Watson's intensifying coils and the motor-magnetic interrupter. I shall perhaps surprise you when I say that the tube which I have used for the last two and a half years has taken every single radiograph in my private practice—not in my hospital practice, of course—and has been used for every part, including the kidney and bladder, the shoulder, the hip, and so forth. During the last two and a half years I have examined 300 kidney cases, a large number of which have been operated upon. In every case in which we pledged ourselves that there were stones, the subsequent operation when it took place showed stones to be present. In no case, of which we have had knowledge of the outcome, has the diagnosis proved inaccurate. One continually gets these troublesome shadows in the abdomen, usually from calcareous glands. I once found in the same subject a stone in the kidney and a calcareous gland. I invariably use an equivalent spark gap of 3 inches, on a 10-inch coil worked from accumulators, and before I commence reduce the vacuum to a spark gap of under 2 inches. I particularly never give an exposure of more than one minute, and in ordinary subjects—*i.e.*, people who are not very stout—the exposures often range from thirty to forty-five seconds. Occasionally with an electrolytic heat I have taken negatives of the kidneys in five seconds. I always use the method of placing the patient on his back, raising up the shoulders, getting the arch of the back right on the board, and using firm pressure with a compression tube, one side of which is about 5½ and the other about 4 inches in height. I put the X-ray tube over the compression tube as nearly as it will go, centring it carefully with a plumb-line. The development of my plate is carried out in the most casual manner. I use a pyro-soda developer: 6 grains of pyro to the ounce of pyro solution. I pour it on to the plates, one after another, cover them over and get them well started, leaving an interval of one minute between each. Then I get an assistant to rock the plates for fifteen or twenty minutes, after which I take them out one by one and put them into the hypo. The results are average good negatives. I have done a little with screen examination of the kidney. I do not think it is of much value. The presence of pus makes no difference whatever to the result. On one or two occasions I have had the catheter passed into the urethra, and it has been of assistance, but the method of dilating the bladder with air and then taking stereoscopic radiographs is much more satisfactory. With the use of the compressor it is perfectly easy to take a stereoscopic radiograph. A definite outline of the bladder is thus obtained, and those little shadows to which Dr. Orton alluded are seen in their relative positions to the bladder-wall. I took a couple of stereoscopic photographs of a case in which there was a chain of five shadows in the lower part of the ureter, in the position instanced by Dr. Orton. Two of the shadows are on a different plane from the other three. This fact rendered it improbable that any of them were ureteral calculi. The whole subject is extremely interesting and difficult, and it is only at meetings of this kind that one can hear all the details and arrive at conclusions of any value.

Mr. E. W. H. SHENTON sent some notes, which were read by the Secretary. Respecting technique, Mr. Shenton said: It is advisable to clear the intestine.

Enquiry should be made as to whether the patient has been taking bismuth, as prolonged administration of this drug will cause intestinal matter to become opaque. I would deprecate compression, except in rare cases. It is important to allow the kidney to move freely, and compare the range of movement of any suspected calculus with surrounding intestinal matter. The careful observation of these relative movements will often prevent erroneous conclusions. As no two workers quite agree as to what is a high and what is a low tube, I think it unwise to use the terms high and low. The tube giving a maximum quantity of rays and a clear image of the renal regions upon the screen is the most suitable, and this can only be selected by trial and error. The more experience the operator has had, the less trouble he will encounter in the selection of a tube. No reliance should be placed upon the milliamperage meter in the selection of a suitable tube. Unquestionably, diaphragms should in all cases be used, varying from 4 inches to 1 inch, the larger being used for preliminary examination and the smaller for careful search over small areas. I have examined more than 2,000 cases of suspected renal stone, and I am absolutely convinced that the screen examination is all-important. With a suitable tube, it rarely happens that the photographic plate reveals more than the screen, when the latter is correctly used. On the other hand, there are many cases easy to diagnose upon the screen which the plate fails to confirm. This is usually due to movements, and at times a compressor will be of value in such cases. Photographs are merely confirmatory of the screen examination. I give a short exposure, not exceeding thirty seconds, and from this negative I print on No. 2 Glossy Gravura—a paper which was first specially made for my work at Guy's Hospital. It is a paper of extraordinary contrast. I believe the system of a short exposure, thin negative, and vigorous printing contrast is the correct one. The less exposure you are forced to give the plate the better, as the fogging rays—I think every radiographer will understand what I mean by the term—will have less time to act. The image, though faint, will be quite perfect, but it requires a very powerful printing process to extract a good image. Though much depends on the suitability of the tube and the transparency of the patient to the X-rays, still more depends upon the operator's skill in observation. It is no more fair to say that X-rays do not show a calculus than that the ophthalmoscope does not show a certain eye condition. In both cases the skill of the individual must be taken into consideration. There can be no question of the efficiency of positive X-ray diagnoses in urinary calculus disease, and though the negative diagnosis is not infallible, it is incomparably better than any other form of negative diagnoses in these conditions. To make a satisfactory diagnosis, the eye of the operator must be in a condition to appreciate the screen image—that is to say, he must have been sufficiently long in a darkened room. Lighting the room with blue light, the complementary colour to the screen image, has been a great help. I would like to call attention to the fact that many otherwise excellent couches now on the market have no provision for tilting the X-ray tube, and the operator is much handicapped thereby. For example, when examining the lower end of the ureter and bladder, the general direction of the rays must be in line with the axis of the pelvic canal, and not vertical.

Mr. C. R. C. LYSTER said: I hold the view that a low tube with a lengthy exposure gives infinitely the best results. Personally, I am old-fashioned in still retaining the method of putting the plate at the back and the tube in front. I use a parchment disc with two uprights, and an air cushion. One point in favour of this method is, that with the patient lying on the back less compression is necessary. The most important point, however, is the good focus of the tube in order that contrast may be secured. Dr. Orton has hit the right nail on the head when he says that the tube is the weak part in renal skiagraphy. I have a few negatives that may be of interest. They were taken with the focus-tube placed in front without any diaphragm. I am inclined to think that the diaphragm is a little over-rated.

Dr. G. ALLPRESS SIMMONS said: Like Dr. Thurstan Holland, I have been fortunate in finding a most phenomenal tube. I have used the same tube in St. Mary's Hospital for a year, and have taken away every skiagram—almost 950—by its means. I use accumulators and a Mackenzie Davidson break. The tube is a Mueller tube with heavy anode, and the ordinary mica apparatus for lowering the vacuum. It starts by being high, lowers itself after running one minute, and remains steady. I have taken a dozen skiagrams in the same afternoon without any lengthy interval.

Mr. JAMES TAYLOR asked what developer Dr. Orton used. He said: I know that Dr. Orton uses a Lumière plate, but it is my experience that no better results are obtained on that plate than on certain others. With the Imperial Orthochromatic I get better results than with the Lumière.

The CHAIRMAN (Dr. Lewis Jones) showed a couple of slides illustrating a point in the paper. In one case an X-ray examination of the renal region suggested the presence of renal calculi. The patient's back was examined, and a small mole was found, rather less than half an inch in diameter. A lead wire was then wound round the mole, and the subsequent skiagram plainly showed it to be identical with the shadow of the supposed calculus. It was therefore possible that a wart on the skin in close contact with the plate might produce an impression simulating the appearance of renal calculi.

The CHAIRMAN also showed a skiagram, taken by Dr. Graham, of *a peculiar injury in the hip region, with perforation of the acetabulum by the head of the femur*. A lady, aged 20, sustained a severe fall upon her side, the force of the blow being concentrated upon the great trochanter. A severe bruise resulted, and the lady was in bed for three weeks. When ultimately a skiagram was taken it was found that the head of the femur had been driven right through the acetabulum and protruded for some distance into the pelvis. Around the head of the acetabulum a quantity of callus had formed, and this was visible in the X-ray photograph.

Dr. G. ALLPRESS SIMMONS showed some *colour photographs* taken on the Lumière Autochrome plate.

Electro-Therapeutical Section.

December 20, 1907.

Mr. W. DEANE BUTCHER, President of the Section, in the Chair.

The Diagnostic Value of the Röntgen Rays in some Diseases of the Chest.

An Address introductory to a Discussion on the Subject.

By A. STANLEY GREEN, M.B.

I BELIEVE that three years have elapsed since the last discussion on this subject was held before the Electro-Therapeutical Society. During this time some progress has been made, and physicians are now more willing to seek and accept the opinion of the radiographer in some, at least, of their chest cases, and I hope that ere long all cases where doubt exists about the presence of pulmonary tuberculosis will be submitted to a thorough examination at the hands of an expert radiographer. The patients are always willing to undergo the examination because they hold that "seeing is believing," and they place more faith on what the physician tells them he has seen than upon what he has heard, and the diagnosis of this disease in its earliest stage is a matter of vital importance, not only to the individual, but also to the State. To ascertain the views that some of our most eminent physicians hold upon this subject, I sent out papers to fifty consulting physicians in Great Britain, and I had most courteous replies from thirty-three. Of these, nineteen informed me that they had no experience on the subject worth mentioning, and of the remainder five answered all three questions with an emphatic negative. Queries: (1) Have you found the Röntgen rays of much value in the diagnosis of early pulmonary tuberculosis? (2) Have you found that when the physical signs show the disease in one lung to be in the so-called second stage, the X-rays in a large number of cases will demonstrate early mischief in the other lung? (3) When the larynx

is involved in the early stages of the disease, do you find that the presence and extent of the disease in the lungs are more easily demonstrated by means of an X-ray examination than by the usual methods? To Query 1, three affirmative, four a qualified answer, looking upon the X-ray evidence as confirmatory only; to Query 2, four affirmative, one a qualified negative, three negative emphatic, four a possible help. The third question was badly worded, and the answers are therefore not of any value.

It is quite clear, therefore, that physicians have not, up to the present, made as much use of the rays as might have been expected, and I gather that their reason for this neglect is because they feel that they are capable of making a correct and accurate diagnosis without any extraneous help. This leads me to think that what they consider to be an early condition would be looked upon by the radiographer as more advanced than the physical signs had led them to suppose; moreover, when disease is sufficiently advanced in one lung to admit of a diagnosis being made in the ordinary way, the Röntgen rays will in many cases, but not in all, show the presence of disease in the other lung. I do not wish it to be understood from this that the X-rays are to be used alone and the older methods discarded: far from it; the clinical history, symptoms, and the physical signs must all be taken into consideration and the rays used as an *aid* to the diagnosis, just as the ophthalmoscope is in many medical cases, and this is the doctrine that I have preached ever since I wrote my first paper on the subject.

It is only necessary to say a few words about apparatus. Personally I use a Gaiffe d'Arsonval installation and find that it does all that I require, though doubtless with a powerful coil and an intensive break the same results can be attained with a shorter exposure. This is, however, not of so much importance in thoracic work as it is in the radiography of the kidneys; thirty seconds is usually ample except in a very burly chest. There is no doubt that good tubes are the all-important factor in producing good radiographs, and the difficulty in obtaining these is very great, for if a large current, say anything over 1 m.a., is passed through them for any length of time they soon deteriorate, and it is most important that the light in the tube should always be absolutely steady, and all reverse current suppressed. Until about two years ago I was in the habit of using Müller tubes, and found them very reliable—in fact, I had one in use for ten months and did all my thoracic work with it during that period, but now I find the Chabaud-Villard the most reliable, although they will not carry more than 1 m.a. for more than a few

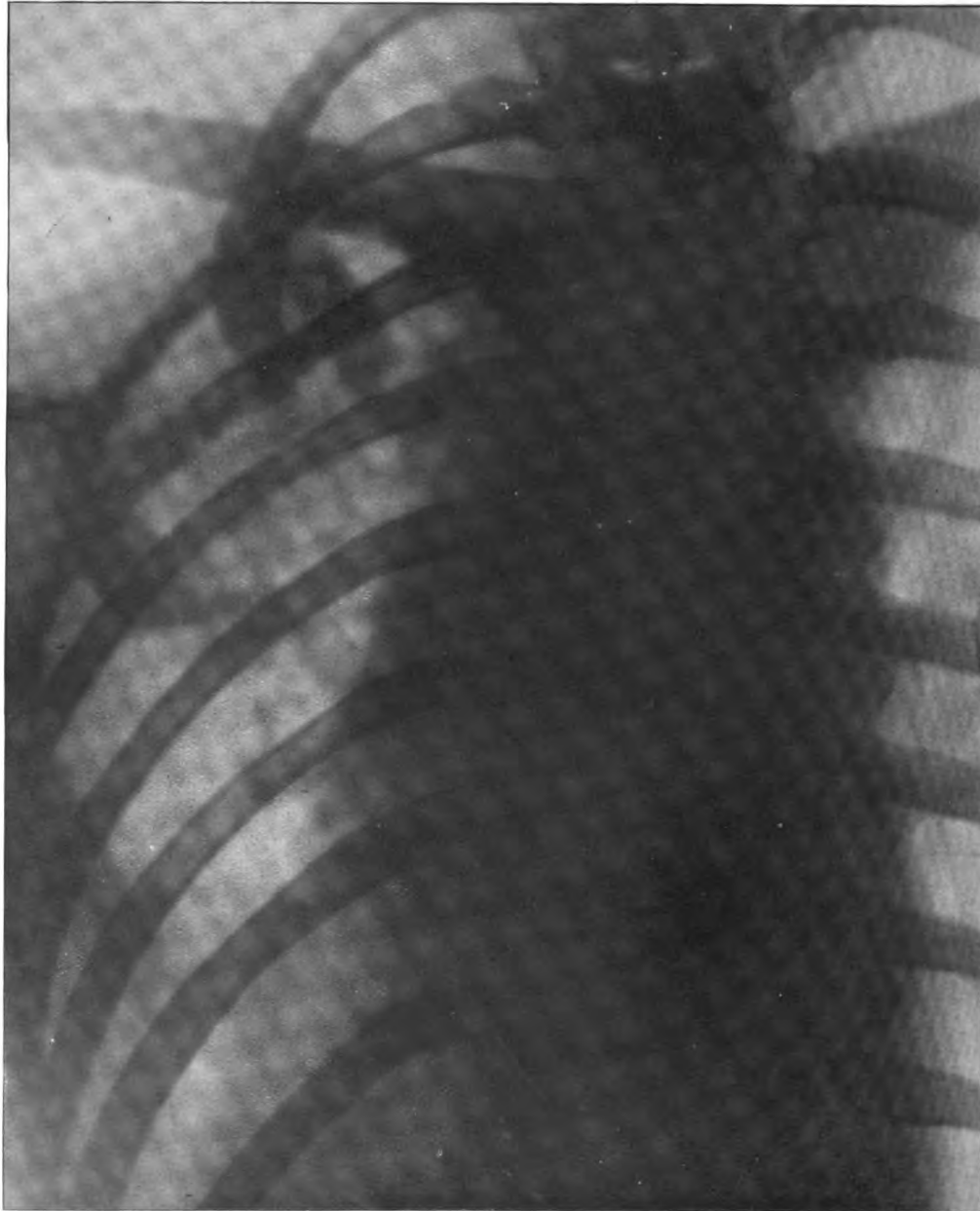
minutes without getting either very soft or extremely hard. I am anxious to hear the experience of other workers on this important point.

I must say a few words about technique because I have from time to time been asked so many questions on the details. I always screen and photograph the patient in the erect position because I have found that the diaphragm moves more freely when they are standing up than in any other position, and they are photographed sitting as erect as possible because they are less likely to cough if they are not asked to lie down; in fact, I may say that I have never had a plate spoiled by the patient coughing since I adopted the sitting posture for the exposure of the plate. I mention this fact because I was speaking to a gentleman four months ago who had been radiographed in London in the prone position, and the negative was useless because his cough was so troublesome. My method of screening the patient is best explained by this little model: to ensure perfect darkness I had a corner of my electrical room built off with black wood in which a large aperture was cut and then covered with a black curtain; the screen, covered with a piece of ground glass (for the purpose of making tracings), can be moved up and down in slots, being held in position by two springs; this device leaves both hands free. It must not be forgotten that luminous sensibility to X-ray light increases immensely after the observer has been in the dark more than ten minutes. The patient leans up against the screen and the movements of the diaphragm are noted and exact tracings made by a method which I will refer to later on; the patient turns about and leans with the chest against the screen, and the movements are again traced on the glass. The tube is now raised to the level of the third intercostal space, and with the back to the screen the apical regions are carefully examined for any shadows. If there is any doubt of the presence or extent of these shadows a diaphragm is fitted on the tube-holder and small areas illuminated, and the effect of inspiration on these shadows carefully observed; if due to recent disease they light up, the fluorescence being gradually diminished until the observer is satisfied; the patient is again turned round and, with the chest to the screen, a further examination is made and the cardiac area marked out. This concludes the screen examination, and the photograph is taken, the plate-to-back method being always used, the advantage being that it is more comfortable for the patient, the ribs do not obscure the shadows so much as they do in the plate-to-chest position, and in a majority of cases the areas of infiltration and consolidation are nearer to the back than to the front, and for this reason a sharper outline is obtained. When both lungs are

taken on the same plate the anode of the tube is placed opposite the mid-sternal line at the level of the third intercostal space and about 20 in. to 24 in. from the surface of the plate; exposure varies from twenty to fifty seconds with the tube working at a $4\frac{1}{2}$ in. spark gap and giving rays of 5 to 7B penetration; if the tube is harder than this the results are not reliable. The development of the plate *must* be done by the radiographer himself, especially in the very early cases, because in some of these the shadows can only be detected by careful watching as they come up in the plate, obscuring for a time the outline of the ribs. When one apex only is affected the difference in the corresponding areas is very marked during the first three minutes; development is carried on for about fifteen to twenty minutes after the image has appeared. I always use Lumière plates because they will stand a lot of developing without showing any fog.

I will now place on the screen a slide of a normal thorax, and you will note the width of the intercostal spaces, equal on the two sides, the translucency of the lung tissue, the position and size of the heart shadow (though, as I have mentioned, this is better seen in the anterior view), and the level of the diaphragm on the two sides; this is nearly equal in this case, but usually the curve is higher on the right than the left. I cannot show you the movements of the diaphragm, but I can show you the excursion which it makes when a deep inspiration is followed by a full expiration: this is called the maximum, and averages $2\frac{7}{8}$ in. on the right and $2\frac{5}{8}$ in. on the left; during quiet respiration the diaphragm moves about $\frac{1}{2}$ in. on each side: this is called the minimum. In this case the movement was equal in both posterior and anterior views, but in the next slide I will show you the thorax of a patient who came to me complaining of a tired feeling, no appetite for breakfast, and a slight early morning cough of three months' duration. You will notice in this, the posterior view, that the movement is less on the right side than the left, the exact measurements being $1\frac{1}{8}$ in. against $1\frac{3}{4}$ in. In this, chest to screen, you will again see the difference, $\frac{3}{4}$ in. to $1\frac{1}{8}$ in.

The next slide is that of a patient who came to me with a slight hæmoptysis; in her case the movement as seen from behind on the right side was practically *nil*, but there was some movement on the left. It will be seen from these illustrations that there is no difficulty in estimating the limitation of movement of the two sides, and also the difference between the anterior and posterior views. Attention was first drawn to this latter point by Dr. David Lawson, under the term "associated movements of the diaphragm," and he proved that where consolidation



Early case of phthisis. Right apical region, very bright. Left apical region, shadows commencing 2 in. below summit of left lung and extending downwards and outwards.

STANLEY GREEN : *Diagnostic Value of the Röntgen Rays.*

is apparently more marked towards the posterior aspect of the lung, the amplitude of the range of movement of the diaphragm, as seen from the back, was considerably less than the amplitude at the front, and vice versa. Furthermore, the relative level of the diaphragm on the affected side, as seen from the back, was higher than that observed at the front. I have found this statement so full of truth that I am often able, from my screen examination, to make up my mind about the situation of the diseased area. I am more than ever convinced that "unilateral limitation of movement of the diaphragm" is the earliest known sign of pulmonary tuberculosis. I quite expect this statement to be challenged to-night during the discussion which I hope will take place. In this case there was a history of pleurisy, and therefore, though there was limitation of movement on the left side, I should not have been justified in making a diagnosis from this sign unless there had been further evidence, such as the faint shadows that you see in the upper half of this lung. (Plate.) Now, this patient had no idea that there was anything the matter with her lungs, but was consulting me for her throat; she was suffering from granular pharyngitis. However, the X-rays left no loophole for doubt, and the patient consented to go to a sanatorium at once. She remained there three months and regained her health, but three years later a family bereavement had such a serious effect on her health that she rapidly lost ground; her right lung became involved and she is now waiting for the end. In addition to the limitation of range of movement there is also limitation in the freedom of movement; and though in some cases the diaphragm may make an excursion of $1\frac{1}{2}$ in., yet this is done in a jerky or stammering manner, and the diaphragm only reaches its lowest level by a series of jerks. Once seen, this is very striking, and I consider it of almost as much importance as the limitation of movement mentioned above.

You have seen the shadows that are present in this disease in the early stage, but I will now enter into more detail. In 1903, Dr. Halls Dally classified them as follows:—

<i>Röntgen Rays.</i>	<i>Percussion.</i>
Brightness.	Hyper-resonance.
Transradiancy.	Normal.
Faint shadow.	Impaired resonance.
Dense shadow.	Dulness.
Opaque.	Absolute dulness.

The progress of the disease can be watched with the rays, and I will now show you the alteration that has taken place in the apex of the right

limit of the fluid is usually concave, and the outer extremity is, as a rule, at a higher level than the inner, but the contour of the opacity changes with every alteration of the patient's body. This is not the case when air as well as fluid is present, as we shall see later. The heart shadow is pushed well over to the opposite side, and the appearance of the lung above the level of the fluid varies. In some cases it is translucent, in others it may be almost as dark as the fluid itself, and when this is the case pulmonary tuberculosis must be suspected and the patient carefully watched, and a second Röntgen examination made when the fluid has disappeared. I feel sure that this is a point of some importance. In this case you will notice that the shadow reaches very high up and the displacement of the heart is well marked. I removed a large quantity of serous fluid from this patient's chest; the shadow of the ribs can be seen through the opacity of the fluid. Some observers say that this is one way of distinguishing between serous and purulent effusions, but I have never been able to satisfy myself about this, and prefer to withdraw a few drops with a syringe. This slide shows a very oblique line running from above, downwards and inwards. The physical signs were vague, and it was only the Röntgen examination which enabled me to give a definite diagnosis when the fluid had disappeared. Definite shadows were seen in the lung tissue, and the patient's eye reacted to Calmette's tuberculin test. In this case we see an oblique line starting at a higher level, and there was a large quantity of fluid present. When it was withdrawn some air entered, and we notice that the upper limit of this shadow, which is due to fluid, is horizontal. This patient also reacted to the tuberculin test. Displacement of the cardiac shadow is sometimes seen when the shadow is intrapulmonary, and is due to the contracting lung drawing the heart over. In this case it is on the same side as the lesion, and is usually accompanied by a condition of the ribs known as roof-tiling. I do not attach much importance to the rib signs, because they only occur in the later stages of the disease, but Dr. David Lawson lays some stress on them, amongst other features, as a factor in determining whether shadows are due to pleuritic or intrapulmonary lesions.

I now show you a slide of a case of pyo-pneumothorax which was mistaken for bronchitis by three medical men; we see the horizontal upper limit which is always present in every position of the patient's body, except when he is lying flat on his back, this being due to the presence of the contained air (also pointed out by Dr. Lawson); a rippling movement was seen in the screen shadow, due to the rhythmical contrac-

tions of the heart; when the patient was shaken splashing could be seen, and when he took a deep breath the level of the shadow rose perceptibly. The area above the fluid is very bright, and is, of course, due to the air; this line above is due to the thickened margin of the compressed lung. (Proved at the autopsy.) I have only had one case of miliary tuberculosis to examine, and in that case there were no signs to indicate that he had any disease of the lungs. The patient, however, was sent to a sanatorium, but was only kept there a short time as no trace of disease could be found in the lungs, and he had tubercular disease in the abdomen; when he died, two months after this skiagraph was taken, his medical man wrote to tell me that lung symptoms were a prominent feature during the last three weeks of his life. Possibly other members have had more experience of this condition than I have.

I have had two cases of primary abscess in the lung. I have been able to find very little in the text-books on medicine about this condition, which is certainly difficult to diagnose by the ordinary methods. In both my cases physical signs were conspicuous by their absence, and the symptoms were pain over a certain area, more severe in one case than the other, a hacking cough without any expectoration until the pus was coughed up, a high temperature, rapid pulse, and one case looked so much like typhoid fever that I sent some blood to be examined, but the Widal reaction was negative. Had I been able to examine the chest with the Röntgen rays I believe that the diagnosis would have been made correctly, but this I was not able to do until they were able to come to my surgery, and by that time the lung was healing quickly; but we see that there is still a shadow in each case, and this is the area over which the pain was most severe and where the one physical sign that could be elicited (impaired resonance) was found. I shall be glad to hear what experience other members have had. There is no time to enter into the discussion of other diseases, *e.g.*, new growths, actinomycosis, mediastinal tumour (of which I have had three cases this year), enlarged bronchial glands, aneurysm, pericardial effusion, hernia through the diaphragm, and carcinoma of the œsophagus; in all these the radiographer can, I think, assist in the diagnosis.

Gentlemen, if I have seemed too dogmatic upon some points I must ask your pardon. I have examined a very large number of chests with the Röntgen rays during the past six years, and upon that experience my opinions have been formed, and I have given them to you to-night with the sole object of provoking a discussion. If I am successful in this I shall be satisfied, and I feel sure that I shall learn a good deal from other

members who have been working in the same field of radiography with better opportunities than have fallen to me.

The PRESIDENT (Mr. W. Deane Butcher), in the name of the Section, thanked Dr. Stanley Green for his interesting address and the admirable slides with which it was illustrated. He (Mr. Butcher) was pleased to see the examples of relief skiagrams, which he believed were the first shown in this country, at all events of the lung. He thought that plastic Röntgenography was destined to play an important rôle in the future of Röntgen diagnosis. The printing need not necessarily be done by the medical man himself. He hoped that in the near future the technical process would be carried out by an expert or in a public laboratory. The amount of detail shown by plastic Röntgenography, not only in the lung itself, but in the hilus, was marvellous. He had seen examples showing very early stages of enlargement of glands in the root of the lung. The shortening of the exposure within the limits of respiration, or even of the heart-beat, was also a matter of very great importance for the future of chart examination. He alluded to the importance of the results of a Röntgen examination as an object-lesson and a warning. Nature's danger signal was usually hæmorrhage, but, short of that, he knew nothing better than a skiagram, or more calculated to impress on a young patient and his friends the importance of early treatment.

Dr. DAVID ARTHUR thanked Dr. Green for his paper and for the challenging spirit in which it was delivered. But he noticed that the author used an equivalent spark-gap of $4\frac{1}{2}$ in. in his tubes, which he (Dr. Arthur) considered too high, and the skiagrams showed it, as the heart came out very poorly. That was due to the tubes being too hard. At one time Dr. Arthur altered his tube for chest cases until he got the greatest amount of screen contrast, and then his results were fairly good. Recently he had employed a tube a little softer than that which gave the maximum screen contrast, and found that 2 in. to $2\frac{1}{2}$ in. brought out detail which a harder tube failed to do. The heart came out almost as black as the ribs. He believed Dr. Green's measurements of the diaphragm were of no practical value, though he agreed that the immobility of the diaphragm was the first sign of pulmonary tuberculosis. The X-rays from the anti-kathode came out in a cone shape, and the further the screen was away from the arch of the diaphragm the more it was magnified. The measurement should be done by orthodiagraphy, when the result would be the same whether the screen was near the dome of the diaphragm or away from it. He had a patient at the

hospital—whom he would show at the clinical meeting—a young man, aged 21, who four months previously had been passed for an insurance office, yet whose lungs were one mass of what seemed to be fibrosis. Cough and physical signs were almost absent, and the diaphragm moved $1\frac{1}{4}$ in. equally on both sides, as shown by the orthodiagraph. He had seen cases of other diseases in which the movement of the diaphragm on one side was retarded. So, while that limitation was suggestive of phthisis, it was not any proof of it, and this was especially seen in a general hospital, where all sorts of cases were encountered. Therefore X-ray examination alone was of but little importance, and, indeed, might lead to gigantic blunders. Still, taken with other methods, it was even more important than examination by the stethoscope alone. In his experience, mediastinal tumours were very difficult to diagnose from lung disease, and the only means of settling the matter was by the stereoscope, which Dr. Green had not touched on or demonstrated. He agreed with Dr. Green's remark concerning tuberculosis in one lung. Among all the cases which he had examined over many years he had only had one in which, with disease of one lung, the other was shown by X-rays to be quite unaffected.

Dr. HALLS DALLY said he was very glad to have heard Dr. Green's lucid exposition. He (Dr. Dally) had always held that unilateral limitation of the diaphragm was the earliest known sign of pulmonary tuberculosis, and the view was supported by many facts. He did not consider that Calmette's ophthalmic reaction was yet established on definite lines; some definitely tuberculous cases had, in his hands, failed to react to it. The same was true of tuberculin injections. The limitation of the diaphragm, taken with other signs, was a very strong suggestion of the existence of pulmonary tuberculosis, quite sufficient to justify sending the patient to a sanatorium. To wait until there were tubercle bacilli in the sputum was to allow very valuable time to go by, and it was better to send a doubtful case to a sanatorium than to wait too long before commencing treatment. When, some years ago, he worked at the subject of the diaphragm in connection with the mechanism of respiration, he found that though the anatomical textbooks were accurate as to the level of the diaphragm, the physiology books were inaccurate, in that they made no reference to the excursion of the central tendon. He regarded the movement of the diaphragm as one of the important agents in the expansion of the apex of the lung. The pericardium, the great vessels, and the root of the lung were all pulled down by the diaphragm, and therefore influenced the expansion

of the apex far more than did the upward and forward movement of the first rib. During the past year Dr. Walsham and he had been working with Groedel's form of ortho-diagraph, which he considered the most accurate means yet known of measuring the movement of the diaphragm. The measurements which he (Dr. Halls Dally) had given in 1903 must now be revised in the light of later knowledge. Since shadow magnification had caused these to be too great, and until the introduction of the ortho-diagraph, it had been impossible to correct for this. The absolute range of movement between deep inspiration and expiration in an adult male was 34 mm. on the right side and 32 mm. on the left; in adult females 27 mm. right and 25 mm. left, making a total average of 30 mm. on the right side and 28 mm. on the left. That "normal" difference which occurs between the range of movement on the two sides must be taken into account in estimating whether there is any pathological limitation. He thought the ortho-diagraph was also useful in the diagnosis of aneurysms and in heart disease. In connection with the Nauheim treatment of heart disease, the heart could now be inspected before the course of baths was begun and afterwards, and the difference accurately noted. By it also the size of the chest organs could be accurately measured, and it eliminated the personal equation largely and the shadow magnification altogether. In some cases, on looking at the patient, apart from the X-rays, one could see a limitation of movement of the chest wall, either at the base or the apex, on the affected side, and in each case that was definitely due to the limitation of the diaphragmatic movement. Owing to the connection between the diaphragm and the apex of the lung, the costal portion of the diaphragm turning up to be attached to the central tendon, the upper part of the chest on the affected side would tend to show a diminution of movement. Those other signs, such, for instance, as loss of transradiancy on screen examination at the suspected apex, he did not regard as earlier than the diaphragmatic evidence, but tending to confirm it. The limitation on visual inspection often occurred long before physical signs developed, but owing to density of overlying tissues was not apparent in all cases where the diaphragm movement was limited, especially where this limitation was but slight in extent.

Dr. HARRISON ORTON regarded a tube of $4\frac{1}{2}$ in. spark-gap as too high, as many shadows would be penetrated by such a tube. He used a spark of about $2\frac{1}{2}$ in. and a heavier current. He agreed that with the tubes used by Dr. Green it was impossible to use more than 1 m.a. of current. Nothing had been said about a ready means of regulating the tube. If

the light coming through the tube were very intense it was almost impossible to estimate the difference of density between two apices, therefore, he thought a rheostat should be at hand in order to regulate the amount of light passing through the chest at the time of the examination. He regarded the erect posture for the patient as the best. When lying down the chest of the patient assumed much the same position as in expiration, *i.e.*, there was not such a clear differentiation of the pulmonary area, and the movement of the diaphragm seemed to be impeded. In the case of thick people it was very important to cut off secondary rays, and by examining small areas of the chest at a time one got better ideas of the shadows than by examining the whole of it at once. He agreed that the best position for the plate was on the back, for then the lattice-work effect formed by the crossing of the ribs was largely missed. The scapulæ could be largely moved from view, which is a distinct advantage, by working from below, placing the patient face downwards and having the arms hanging over the head of the couch. He (Dr. Orton) employed a rather concentrated developer, and used it quickly, never taking more than ten minutes. It was important to regard the X-rays as an aid to diagnosis only. In an interesting case recently he would have concluded from the X-ray examination that it was a case of fibroid lung. The right side was clear and the left side in dense shadow, and no part of the mediastinum on the right side could be seen. Post-mortem, it turned out to be an aneurysm pressing on the left bronchus. The whole of the left lung had collapsed, and had drawn the heart and mediastinum over to that side. The ortho-diagraph he regarded as absolutely necessary for measurement of the movements of the diaphragm, the arch of which varied in different people, and the range of movement would depend on the distance from the surface of the greatest convexity of the arch unless the ortho-diagraph was employed. He did not now think the limitation of movement of the diaphragm was so constant as he at one time believed. He had seen several early cases in which there was no such limitation, only the jerky movement which Dr. Green had mentioned. In more advanced cases the diaphragmatic movement might not only be equal to normal, but might surpass it. He had seen advanced cases in which one apex was very deep in shadow, and where the movement of the diaphragm on the affected side exceeded that on the sound side. He agreed that in many cases where only one side was considered to be diseased X-rays showed both to be involved. He asked how much shadow could be obtained in a normal chest. He had two skiagrams of anæmic girls, with no signs of phthisis two years ago, and still with no signs of it, but

with distinct shadows on each side of the mediastinum, extending much farther out than the usual mediastinal cardiac lines. In one of them the shadows seemed to follow the distribution of the vessels, and it had been suggested they might be due to tubercle commencing round the lymphatics. In a case of lymphadenoma the patient died of pneumonia ten days after examination with the X-rays. There were very similar shadows, and post-mortem nothing was found in the lungs except pneumonia, which was just commencing at the time of the examination. He believed that when using a very low tube, such as one of 2 in. spark-gap, the normal chest might throw shadows which were likely to be confusing. There was much to be learnt before a correct interpretation of normal shadows could be arrived at.

Dr. SQUIRE said he purposed speaking rather as one accustomed to rely upon examination by the stethoscope and other physical methods than by the skiagram, in which he could not pretend to be an expert. Even physicians who were thought to ignore X-rays really regarded them as valuable aids in diagnosis, especially in any doubtful cases. But the opener was somewhat dogmatic about the diagnostic powers of the rays. He (Dr. Squire) particularly wished to ask whether there was anything about the shadows revealed by the X-rays as representing consolidation or tubercular lung disease to show whether the lesion was quiescent or, on the other hand, a focus which required active treatment. That point alone would show that unsupported X-ray examination must not be relied on any more than any other means. He asked, also, whether the pictures shown were supposed to represent early cases of disease which would yield no evidence to the skilled physician by the ordinary examination. The amount of shadow in the majority of those cases seemed so great that they would have caused no difficulty to anyone at all accustomed to examine lungs. He had not heard anything to convince him that skilled physical examination by the older methods would not detect mischief in the lungs as early as could be found by X-ray examination, although he agreed that the patient would be more impressed by seeing than by being told what somebody else could hear.

Dr. LEES said that, for a considerable time, he had been very much interested in the question of the exact determination of the earliest indications of pulmonary tuberculosis, and he had attended on the present occasion in anticipation of hearing some additional facts which might be of service to a physician in investigating that most important question. But he agreed with Dr. Squire that most of the skiagrams thrown on the screen seemed to be from cases so advanced that there

would not have been the slightest difficulty in proving, by careful percussion, the presence of areas of dulness. He was not an expert in skiagraphy, but, with the help of his friend, Dr. Simmons, he had made a few observations at St. Mary's Hospital to ascertain whether the X-rays were able to reveal the presence of tuberculosis of the lungs when it was difficult or impossible to do so by physical examination. That, he considered, was the crux of the whole question. All would acknowledge that X-rays were a most valuable means of investigation, and that they sometimes showed what otherwise would be difficult to ascertain; but the question as to the earliest indications of tubercle was not so definitely settled as the reader of the paper seemed to imagine. The observations he had made convinced him—and he thought they convinced Dr. Simmons also—that the X-rays failed to show any distinct shadow in cases where the loss of resonance was quite definite on careful examination. If that turned out to be true generally, he thought it must be acknowledged that, however valuable the X-rays might be, they could not demonstrate the existence of tuberculosis in the lung at as early a stage as was already possible by methods of physical examination. Unfortunately, text-books gave very little help when one asked the question as to what were the earliest physical signs of tuberculosis of the lungs; stress was usually laid on auscultation. But really that was incorrect. The earliest indications of pulmonary tuberculosis were exactly the same as those of pneumonia. In pneumonia, long before the bronchial breathing, before the sharp inspiratory crepitus, there was a period, in many cases at all events, as was pointed out by Professor Osler, when the evidence was confined to local loss of resonance and feebleness of air entry, showing that that part of the lung was not acting. The same was true in the earliest stage of pulmonary tuberculosis, and the signs to be looked for were not auscultatory mainly, but indications given by careful percussion. That remark made it necessary for him to say what he meant by careful percussion. He excluded at once all percussion in which instrumental aid was used; the percussion which must be employed was finger percussion alone. It must also be a very light percussion. Hammering, such as some medical men practised, was absolutely useless. The percussed phalanx of the percussion finger must be firmly pressed on the point to be percussed, the rest of that finger and the rest of that hand being kept entirely away from the chest-wall. Such percussion was capable of detecting stages of pulmonary tuberculosis which were quite early and which he believed to be undiscernible by the X-rays. It was a strange fact that, although

seventeen years ago Dr. Kingston Fowler drew attention to the precise positions in the lung where the earliest deposit of tubercle was to be found, and showed that the disease progressed in a definite course from those spots, and although these statements had found their way into the pathological descriptions of the text-books, they had not in any appreciable degree modified the clinical description of the disease. If physical examination were carefully made it would be found that, exactly in accordance with Dr. Fowler's results, localised spots of dulness and feebleness of air entry could be detected in certain definite places. It was in the first intercostal space on either side of, and close to, the manubrium that the first evidence of tubercle could be detected, not at the extreme summit of the lung, but at a spot 1 in. to $1\frac{1}{2}$ in. below it, as seen in the post-mortem room, and therefore probably 2 in. below it in the living body. Dr. Kingston Fowler also showed that in the outer part of the lung, at the same vertical level, there was frequently another area of disease; this also can be detected by physical examination in the outermost part of the first intercostal space. Both these areas can also be detected posteriorly: the former close to the uppermost dorsal vertebræ, the latter in the outermost part of the suprascapular fossa. In addition Dr. Fowler showed that an early deposit often occurred in the lower lobe, at a similar distance below the apex of the lower lobe; this can easily be detected by careful percussion behind the inner end of the spine of the scapula, and below this point downwards and outwards. In most of the cases of early tuberculosis physical signs of that kind were to be detected at all four apices; and he was surprised to hear the opener suggest that, in a considerable number of cases, physical examination limited the disease to one side. Careful physical examination showed that very rarely was the disease limited to one side. When there were distinct signs at one apex, almost always something, though less, was to be detected at the other apex also. He challenged discussion on the point as to whether careful physical examination, especially by percussion, did not reveal pulmonary tuberculosis at a very early stage, earlier, he believed—though he was open to correction—than could be revealed by X-rays.

Dr. LYSTER said that, as a result of his personal experience, extending some years back, he could not detect signs of pulmonary tuberculosis before they were plain to the physician who sent him the cases. But it was a pity to press the question too far at the present time, because there was still room for improved accuracy in the instruments employed: the tubes varied, and observers could not yet say, with sufficient

accuracy, what a shadow cast by the lung tissue meant in an early case. Still, he thought radiographers could be of great service to physicians by keeping charts indicating the progress of tubercular disease. He had now pictures of several cases extending back three years, which had been radiographed every three or four months, and in which the change in the diseased areas was very instructive. It was a pity to attempt to diagnose tubercular disease of the chest by means of the rays alone.

Dr. D. SOMERVILLE said he would like to hear more about the interpretation of the shadows which were demonstrated. The most important part of scientific research was not so much the collection of facts as their interpretation, and he wished to hear whether, among the radiographers, there were any definitely agreed lines of interpretation. The tubes and the methods of development varied greatly; the personal equation, however, always entered into the question. He had failed to detect any definite lines along which one might safely reason in the matter.

Dr. SAMUEL WEST thought it possible that enthusiastic X-ray workers might be tempted to feel too sure of their ground in diagnosing very early stages of pulmonary tuberculosis; but it must be admitted that there were cases of lung disease, deep-seated, and manifest from the clinical symptoms afterwards or by post-mortem examination, which could not be practically detected during life. There were cases of fatal hæmoptysis in patients who had been most carefully examined, and in whom the hæmoptysis had come as a complete surprise. There was a group of cases absolutely undiagnosable from physical signs, and in those X-rays might give very great help. He agreed that there was a danger of pressing the matter too far at present, and thus injuring the cause which they had at heart. The author, no doubt owing to pressure of time, had left much unsaid that he would have liked to say, and Dr. West was inclined to accept some of his statements with reservation. Dr. Green did not give any reason for believing that the cases he referred to as abscess of the lung were such; they probably were empyemata, perhaps interlobar. He did not see how the X-rays could distinguish between these conditions—only a post-mortem could settle that. He had received the the greatest benefit from X-rays in a certain number of cases in which he could not interpret the physical signs. In a recent one, a man had dysphagia, due, it was supposed, to stricture of the œsophagus, but X-rays plainly showed that it was due to an aneurysm, the pulsation of which was beautifully visible. With regard to the curious curve in pleuritic effusion, he was a little sceptical about that, but

he would now study the matter with greater interest. He had not been able to satisfy himself, from simple percussion, about the existence of the S-shaped curve in pleuritic effusion. He agreed that the question was not so much one of facts as the interpretation of them. Probably some of the curve shown was due to collapse of the lung round its own root, which would allow fluid to flow up behind and at the same time raise it a little further in front, and thus give the elevation shown in the radiogram on the outside. The discussion had been a most useful one, and, as was often the case, its chief value lay as much in suggesting lines of investigation for the future as in imparting knowledge at the time.

Dr. HINDS HOWELL said he recently saw a tabetic patient, under Dr. Ormerod's care, at the National Hospital, suffering from paralysis of the left vocal cord. Sir Felix Semon examined the larynx, and asked whether there was any chest disease which might cause the laryngeal condition. Dr. Ormerod and others had examined the chest, and had found no evidence of any pathological condition which would produce pressure on the recurrent laryngeal nerve. But it was thought best to have the patient examined with the screen, when it was at once seen that there was an aneurysm of the transverse aortic arch, which was probably causing the paralysis of the cord. Apart from the value of the X-rays in making the diagnosis, that case was interesting as illustrating a not very uncommon fact, that paralysis of the vocal cord might be the first symptom caused by aneurysm of the arch of the aorta. Dr. Hinds Howell exhibited the radiograph which he had taken of the patient's chest.

Dr. ALLPRESS SIMMONS said he thought the discussion had been confined to tubercular disease and other conditions of the lung rather than aneurysm. X-ray men were of opinion that aneurysms could be certainly diagnosed by the method of oblique illumination, an interesting paper on which was read by Dr. Orton some time ago. In all cases of suspected aneurysm, or of paralysis of one vocal cord, an X-ray examination should be held, as a diagnosis could sometimes be made in that way when it could not by any other means. He thought chests should be examined by the rays more frequently than was at present done. He agreed with Dr. Lees that the highest percussive skill would reveal tubercular disease before X-rays would, but all medical men did not possess that highest percussive skill, and he was sure many cases of early phthisis were missed in the rush of general practice. X-rays came in conveniently between the highest percussive skill and the ordinary routine physical examination.

Dr. J. A. CODD (Wolverhampton) said he felt greatly indebted to Dr. Green for bringing the subject forward. All present might not share the author's optimistic view as to the value of the present knowledge of X-ray work in contrast to the ordinary physical examination, but the subject required dealing with, and any contribution was welcome, especially when it was accompanied by an accurate description of technique. He was sure that the acme had not been reached in the diagnosis of thoracic disease. He had not convinced himself that it was a superior method to physical examination, but he was in a position of both physician and radiographer to a provincial hospital, and the surgeons required him so much that he had not much time for his own cases. But the address had given him a stimulus to pay more attention to medical cases, and especially cases of tubercle. There must be a large number of cases in which aneurysm was suspected but could not be diagnosed, and yet in which the rays showed it clearly. In some the rays showed it where it had not even been suspected. But even in regard to aneurysm, the details required to be carefully gone into, because sometimes pulsating shadows could be seen on either side of the shadow of the vertebral column which were not aneurysms, at least not of the saccular variety. He was surprised to find that in none of the slides had the diaphragm been used. He had invariably used it for some years, rather widely open. He believed the increased definition was worth the sacrifice of area. He proposed to go on with the same method, and also to get exposures of the whole area for the sake of comparison, in the same way as different magnifications were used in microscopy.

Dr. GREEN, in reply, said his object had been to raise a discussion, and in that he had succeeded. He believed it was the first discussion on the subject which had taken place for many years; he had read papers before audiences, but they had remained silent. He thanked all the speakers for their courtesy, especially those who differed from him. It was justifiable, from that point of view, to be dogmatic. There were more questions to reply to than there was time for. He again insisted that a patient was much more willing to go to a sanatorium if he saw the skiagram than if he were told what he had got. He had tried all sorts of tubes, and concluded that he had got better results with a 4 in. to 4½ in. spark-gap than with a softer tube. He did not want the heart shadow but the lung shadow, which was what he obtained. He insisted that it was very difficult to make lantern slides from radiograms; the negatives of them were much more instructive. In one case, he radiographed a patient who was sent to a sanatorium, and in six weeks the physician

wrote that he found physical signs where the shadow was seen. He had not used the stereoscope; it was a very expensive apparatus, and he was not attached to a hospital. In answer to Dr. Arthur, he would not expect to find the same limitation of movement of the diaphragm in fibroid phthisis; when the patient began to improve, there was more movement of the diaphragm. He believed more detail was obtained by a long exposure; he had tried both. He used the diaphragm in screen work, and found it useful. He believed physicians would agree that a large number of cases of pulmonary tuberculosis were not diagnosed until they had become fairly late cases; but if they were put before the screen they would not be missed. All physicians were not as skilled as those who had spoken that evening. It was of the utmost importance that the patient's disease should be diagnosed at the earliest possible moment. As he had laid down ever since he spoke on the subject five years ago, X-rays were to be used as an *aid*, and only as an aid, not with the idea of usurping the physician's place. He did not say much about aneurysm, as that was discussed by Dr. Orton at a previous meeting. He hoped to learn something about abscesses of the lung; he did not think the cases of which he showed pictures were interlobar empyema.

Electro-Therapeutical Section.

January 24, 1908.

Mr. W. DEANE BUTCHER, President of the Section, in the Chair.

The Treatment of Leukæmia, Exophthalmic Goitre, Sarcoma, &c., by X-rays.

By W. IRONSIDE BRUCE, M.D.

THE patients I wish to show at this meeting are suffering from definite and easily recognised diseases, and their conditions have been materially improved by exposure to the Röntgen rays; although the results of these few cases, and indeed of many others reported on, are exceedingly hopeful, no conclusion can yet be drawn as to the efficacy of this method of treatment and the possibility of a cure. The method of exposure has been the same in every case. In the early days the not very encouraging results in radiography can be assigned to the inadequate apparatus used. At the present time we can get better results by using improved apparatus. Yet there is a tendency when it comes to therapeutic exposure to use rather less efficient machines. I am of the opinion that the better the apparatus the better the results therapeutically. In the cases shown this evening the coil used was a 10 in. Watson intensified with motor magnetic break; the primary taking 5 to 6 amps. 100 volts; the tube being kept 8 in. to 12 in. from the skin over the part to be exposed. Time of exposure ten minutes, not more than three times a week. The most important points in managing such exposures are, in my opinion: Firstly, the tube must be a good and fresh one with an equivalent spark gap of not more than 6 in. It ought to be capable of easy regulation, and should have a water-cooled anode. The tube we are in the habit of using at Charing Cross Hospital has a specially constructed anode (by H. Helm), and the mica used for regulation is unusually great in bulk. Secondly, the use of a filter. In the cases I am about to show four layers of thick felt were used. This filter

is not an absolute preventative of dermatitis, but it prevents all risk of severe burn, and keeps the reaction, if any, within reasonable bounds. At the same time it does not in any way interfere with the action of the X-rays, as proved by the results in the cases I am about to show you, and especially in leukæmia.

The first case I bring forward is that of a man aged 44½. The case was seen by Dr. Mitchell Bruce and a diagnosis of spleno-medullary leukæmia was made. Dr. Bruce found that he complained of weakness and dropsy of the legs. His condition was: Complexion pale, sallow; very anæmic; expression anxious; some mental depression. There was marked enlargement of liver and spleen, the spleen extending downwards within 2 in. of groin, and to right 1½ in. beyond the umbilicus; the liver extending two fingers' breadth below the costal margin. There was also some breathlessness on exertion and some œdema of the legs. X-ray exposure was commenced on October 21, 1907, the spleen only being exposed. No other form of treatment whatsoever was adopted. The effect of the exposures on the blood-count is shown in Table I. The improvement in the patient's general condition

TABLE I.

Date	Leucocyte count	
November 4, 1907	555,000	
" 7 "	514,000	
" 11 "	443,000	Exposure three times a week.
" 19 "	411,000	
" 22 "	264,000	
" 29 "	150,000	
December 3 "	152,000	
" 6 "	120,000	
" 18 "	101,000	
" 28 "	45,000	
January 8, 1908	38,000	
" 15 "	41,000	No X-ray exposure to present date.

was somewhat slow, but lately he has lost the look of extreme anæmia. He has gained weight and strength, and the feeling of depression has gone. The spleen is markedly smaller in size, and now only extends downwards a hand's breadth below the costal margin, and its right margin lies well within the umbilicus. There is to be seen only the slightest sign of reaction of the skin over the exposed area.

The second case is that of a woman, aged 41, who was admitted into Charing Cross Hospital under the late Dr. Montagu Murray. She was suffering from symptoms of extreme anæmia, being unable to get about and do her housework, and finally being obliged to take to her bed. The spleen was markedly enlarged, extending to the right wall beyond the

umbilicus and downwards almost into the left groin. The blood-count on March 7, 1907, showed the white cells 360,000, the character of these cells being largely myelocytes. X-ray treatment was commenced by exposure of the spleen only on that date. No other form of treatment was adopted. The subsequent blood-counts are shown in Table II. The

TABLE II.

Date		Leucocyte count	
March	7, 1907	...	360,000
June	12 "	...	60,000
July	1 "	...	58,000
"	19 "	...	47,000
August	2 "	...	44,000
September	16 "	...	59,000
"	30 "	...	40,000
October	14 "	...	29,000
November	8 "	...	48,000
"	20 "	...	30,000
December	2 "	...	30,000
"	27 "	...	22,000
January	17, 1908	...	32,000

Exposure three times a week.

Exposure twice a week.

Exposure three times a week.

Exposure once a week.

Exposure twice a week.

Exposure once a week.

most marked change in this case occurred in the general condition of the patient. The extreme anæmia disappeared, and she was able to attend as an out-patient at the hospital and to resume her household work. The spleen has to some extent diminished in size and bulk, and on palpation it is extremely hard and well defined in outline, a condition which is characteristic of this organ during exposure to X-rays. It is to be particularly noted that the skin shows little evidence of continued exposure. It would appear from these two cases that it is only necessary in spleno-medullary leukæmia, first, to expose the spleen only; second, to be entirely dependent on the blood-count as an indication of the number of exposures necessary; third, not to strive to get the white count more near the normal than, roughly, 40,000; fourth, that the improvement in the general condition of the patient is the most marked beneficial result obtained.

The third case is that of a young girl, aged 16, who came as an out-patient to Charing Cross Hospital under Mr. P. Daniel. He recognised the disease as being exophthalmic goitre. The thyroid gland was enlarged and pulsating, and the patient suffered from the usual muscular weakness, shortness of breath and palpitation. She was unable to get about with comfort, and could not even walk short distances without stopping to rest. The pulse-rate was taken as an indication of the condition of the patient. On November 21, 1906, it was 106. X-ray treatment was commenced, and an exposure on each side of the neck to include the

thyroid gland was made three times a week. The relation of the pulse-rate to those exposures is shown in Table III. The general condition of

TABLE III.

Date		Pulse-rate	
November	21, 1906	...	100
December	3 "	...	98
"	10 "	...	80
"	14 "	...	88
"	28 "	...	92
January	2, 1907	...	72
"	11 "	...	84
"	25 "	...	84
January,	1908	...	86

Exposure three times a week.

Present condition.

the patient was found to be materially improved. The muscular weakness and palpitation had disappeared, and she was able to get about without feeling out of breath. The thyroid gland was still prominent, but the pulse-rate was no longer high. When taken last it was 86.

The fourth case is that of a girl, aged 19, a well-advanced case of exophthalmic goitre, suffering from all the usual symptoms associated with this disease—profound muscular weakness, shortness of breath, loss of flesh and palpitation. Her pulse when she began treatment was from 112 to 120. X-ray exposures were carried out three times a week. Table IV. shows the relation between those exposures and the pulse-rate.

TABLE IV.

Date		Pulse-rate	
August	4, 1906	...	112
"	31 "	...	112
September	3 "	...	108
"	24 "	...	100
October	1 "	...	96
November	16 "	...	88
December	14 "	...	96
January	18, 1907	...	84
February	24 "	...	84
March	22 "	...	84
May	1 "	...	92
July	12 "	...	88
September	2 "	...	80
October	9 "	...	84
January,	1908	...	80

Exposure three times a week, except for holidays.

Present condition.

The treatment has been followed by the most marked beneficial effects. The pulse has fallen from 120 to 80, and all the other symptoms have been markedly relieved. There has been no great difference in the size of the thyroid gland. The two cases of exophthalmic goitre seem to suggest that it may be necessary to continue the exposure for a very long time, and it is therefore absolutely necessary to use the filter to avoid

damaging the skin. The improvement in the general condition so well seen in these cases takes place apparently without reduction in the size of the thyroid gland or improvement to any marked extent of the condition of the eyes.

The fifth case is that of a man, aged 72. This patient had when first seen a hard nodular growth with an ulcerating surface involving the posterior part of the hard palate and extending to the soft palate; one gland about the size of a small walnut in the submaxillary region; a small papillomatous growth on the left side of the tongue $\frac{1}{2}$ in. from tip. The case was considered inoperable. X-ray exposure was carried out through the wide open mouth, the patient holding forward the tongue, and the side of the neck on which the infiltrated gland was to be felt was exposed from the outside. X-ray exposure was carried out as shown in Table V. The ulceration of the soft palate was found not to

TABLE V.

December 12, 1905	...	X-ray exposure three times a week.
April 4, 1907	...	Papillomatous growth removed from tongue and proved to be epitheliomatous.
April 15, 1907	...	Resumed X-ray exposures.
January, 1908	...	Present condition.

advance, and, indeed, at times it almost healed up. The submaxillary gland gradually disappeared, and in April, 1907, the papillomatous growth of the tongue, which had not increased in size, was removed by operation. As soon as possible X-ray exposure was recommenced, and the present condition of the case is, as you can see, fairly satisfactory.

The sixth case is that of a man, aged 47. This patient in 1899 had a tumour of the lower jaw which was excised by Mr. Stanley Boyd and proved to be of the nature of an endothelioma. In 1905 some recurrence was discovered and the growth was removed for the second time. In August of the same year it was found that the growth had again recurred and that it was not possible to be of any further assistance from a surgical point of view. X-ray exposure has been carried out since then till the present date somewhat irregularly. The greater part of the recurrence has disappeared, and at the present time the patient shows little sign of its presence.

TABLE VI.

Tumour of lower jaw excised (proved to be an endothelioma)	...	1899
Some recurrence operated upon	...	1905
Second recurrence, no further surgical assistance possible	...	August, 1905
X-ray exposures from	...	August 15, 1905
Present condition	...	January, 1908

The seventh case is that of a man, aged 41, sent to me by Mr. Pardoe as a case of recurrent sarcoma of the abdominal wall. Shortly, the history of the case is: A tumour had been removed from the abdominal wall which, when examined, proved to be sarcoma. Some time after operation the growth recurred. On May 17, 1907, there was to be felt extending for about 2 in. on either side of the scar of the operation a hard mass. Some glands were to be made out in the left groin. The scar had broken down and was discharging. X-ray exposure was carried out three times a week, and the patient's present condition is satisfactory.

Six of the seven patients whose cases are mentioned above came to the meeting and submitted themselves for examination.

TABLE VII.

X-ray exposure commenced	...	May 17, 1907
Present condition	...	January, 1908

DISCUSSION.

Dr. R. MORTON said that he had been particularly interested in the passage from Dr. Bruce's paper which referred to the suitability of certain materials for the purpose of X-ray filters. At the London Hospital they used a single thickness of felt or other material saturated with some substance having high atomic weight, such as tungstate of soda. In no case that had come under his notice had there been any dermatitis; indeed, he regarded acute dermatitis as a thing of the past. Sometimes he got a small degree of hyperæmia. He could not see that the therapeutic effects as regarded the deeper structures were at all diminished by using the filter. Most commonly he used lint saturated with a solution of tungstate of soda and laid it over the part. He regarded this method as having advantages over that employed by Dr. Bruce, as the four thicknesses of felt, in the summer at all events, were likely to cause discomfort to the patient.

Mr. A. EDMUNDS said that the first thing that occurred to him on listening to Dr. Ironside Bruce was the remarkable diversity of the cases which were amenable to X-ray treatment, but on considering the matter a little more closely they fell naturally into a group. Cases as widely separated as malignant disease and spleno-medullary leukæmia had one thing in common: The prominent factor in both diseases was the overgrowth of some particular cell. There were cells in those diseases which were in excess of the normal number of cells required. In malignant disease the large overgrowth of epithelial cells was affected by X-rays, and in leukæmia the same thing was true of the overgrowth of white cells. Dr. Bruce's case of cancer of the tongue was to him (Mr. Edmunds) a disappointment. He had been hoping that the X-rays would be of great value in that direction, but he feared that that particular case must be struck out of the list. The punched-out ulcer of the

soft palate made the diagnosis of malignant disease of the tongue doubtful. In exophthalmic goitre one was dealing with another kind of condition, but here he believed that the cases might be nothing more than the soft goitre common among young girls. This he had seen improve under the simplest treatment, such as the mere administration of iron, without any application of the X-rays whatever.

Dr. DONALD BAYNES, speaking of the treatment of certain diseases by X-rays, said that if there was any other possible means of curing the cases he would be very much inclined to follow it, but cancer and sarcoma were, perhaps more than any other class of cases, amenable to X-ray treatment. So far as leukæmia and exophthalmic goitre were concerned, he thought other methods of treatment would give more satisfactory results. At any rate there would be no danger with the ordinary methods of treatment of bringing about such conditions as calcareous degeneration of the kidney, with necrosis of the renal epithelium, &c., as Warthin's experiments on animals and post-mortem examinations show to have taken place as the result of X-ray treatment or exposure. He wished to congratulate their old colleague on his paper.

Dr. H. LEWIS JONES thanked Dr. Ironside Bruce for the trouble he had taken in bringing so many patients to the meeting. He was much interested to see the cases of exophthalmic goitre because, as many of them remembered, the X-ray method of treating that disease was first reported from abroad, and good results had been observed. But the experience of most observers was that the treatment of exophthalmic goitre by the X-rays was disappointing, although sometimes one might secure a good result. In one instance he had found benefit follow from mild X-ray treatment, the pulse-rate coming down to 82 and staying there for a considerable time after X-ray treatment had been suspended. Although in Dr. Bruce's experience long and heavy treatments appeared to have succeeded, he (Dr. Lewis Jones) ventured to think that milder treatment more spaced out would be quite as satisfactory.

Dr. HINDS HOWELL, speaking with regard to the first case of exophthalmic goitre, said that he did not know what the condition of the patient was when she first came under Dr. Bruce's observation, but he could not agree with the remark of one speaker that it was a case of soft goitre of young girls. The patient (Dr. Bruce's third case) seemed to be suffering at present from myxœdema. Her whole appearance was very phlegmatic and suggested the disease. She said her hair was coming out, she never perspired, and she was getting very stout. Her mental processes were slow. He thought she would be an interesting case to watch. He did not know whether myxœdema was a condition which might be produced by the X-rays. Possibly the treatment this patient had received was instrumental in producing her condition.

Dr. W. IRONSIDE BRUCE, replying to Dr. Morton, said that although the four layers of felt might be warm in summer they would have a compensating advantage in the winter. He very much doubted whether anything cheaper than the felt filter could be produced. No such elaborate arrangement as mentioned by Dr. Morton was, in his opinion, necessary. With regard to the

criticisms offered respecting the diagnosis of the cases shown, he hoped that it would be understood that he was not wholly responsible, for in each case the disease was recognised by independent and competent observers. He adhered to his statement regarding the nature of the disease in case 5, and he knew that other methods of treatment, such as potassium iodide, had been given a fair trial without success before the diagnosis of epithelioma was made. The girl (case 3) was certainly a great deal stouter than when treatment commenced. He was not surprised at the suggestion that she was suffering from myxœdema, and surely if, as a result of the X-ray exposure, she had developed this disease, it was easier to treat than exophthalmic goitre? For instance, the second case of exophthalmic goitre attended as an out-patient for a very long period, and never really derived any benefit from customary methods of treatment. Myxœdema, on the other hand, could readily be got under control. In reply to Dr. Donald Baynes, who said that he had hoped something would have been said about the effect of prolonged administration of X-rays on the kidneys, Dr. Bruce said that he could not think at the moment of having had a case brought to his notice with any bad effects following X-ray exposure.

Fractures of the Scaphoid Bone.

By G. HARRISON ORTON, M.D.

IN showing a number of slides of fractures of the scaphoid bone of the carpus, Dr. Orton said that of all the bones of the carpus the scaphoid appeared most frequently to sustain fracture, and, as would be seen in the slides, the fracture was almost always in the same situation. As in a Colles's fracture of the radius, fracture of the styloid process of the ulna was often associated with it. There might be dislocation of one of the fragments and also of other bones of the carpus, generally the semilunar. The fractures he showed were all produced by indirect violence, generally by a fall on the hand, though he knew of one produced in a goalkeeper by fisting a football. The fractures were as a rule undiagnosed except by X-rays, and there was a tendency for the fragments to remain ununited, which seemed to produce loss of power and pain in the wrist. One of the cases had been ununited since November, 1906, and it caused more pain and inconvenience now than a few years ago. He had heard it suggested that if the fragments did not unite it would be a good thing to remove a portion of the bone. Other members might be able to give the results of their experience on this point.

Mr. A. D. Reid showed a similar slide of a fracture in the carpus, together with the fragment which was extracted. This case was not

diagnosed for nine months after the accident. Eventually it was decided to operate. One tiny strand had united, but beyond that there was no union whatever

Dr. W. Y. Somerville also sent a slide showing a case of fracture of the scaphoid.

Case of Gonorrhœal Warts.

By A. D. REID.

THE patient was a boy with an enormous growth of very diffuse gonorrhœal warts on the penis. The case was not yet completed, but showed great improvement. It was the only one he had seen of this



Case of Gonorrhœal Warts.

particular kind. The boy was treated with X-rays, having in all twelve sittings of five minutes each, spread over a period of two months. When he first came under treatment the growth of warts was so diffuse that the glans could not be seen, and the treatment by X-rays was regarded as a forlorn hope in lieu of amputation. The X-ray treatment had been discontinued for nearly a month, and beyond the use of wet boracic lint and iodoform powder, which the boy dusted on himself, nothing had been done. The boy came to the hospital in July, but did not commence the X-ray treatment until the middle of November. As members would see, a great improvement had already taken place. The case had been examined microscopically, and gonococci had been found.

DISCUSSION.

Mr. BEDDOES said that the treatment appeared to be rather slow as compared with the ordinary savin and subacetate of copper treatment. He suggested that a more rapid recovery might have taken place if iodoform had not been used.

The PRESIDENT (Mr. Deane Butcher) said that he could bear testimony to the value of the X-rays in the treatment of specific warts about the anus. These were best treated by X-rays, by high frequency, or by the introduction of magnesium ions. The treatment of pruritus and warts about the anus and scrotum was most satisfactory. He had been surprised and delighted with the quick results obtained. After long treatment extending over months and sometimes years by other methods he had seen X-rays give prompt relief.

Plastic Röntgenography.

THE President, Mr. Deane Butcher, showed some lantern slides illustrating plastic röntgenography. The originals had been kindly contributed by Dr. Béla Alexander, of Késmárk, the originator of the method. He also exhibited two skiagrams of a fœtus, taken from the same negative. A great amount of detail was brought out by the mere process of printing according to the plastic method. Another series of plastic skiagrams was exhibited, taken by an English worker, Dr. David Morgan, of Liverpool. An ordinary skiagram of the pelvis, showing the outline of the bladder filled with urine, was compared with the plastic röntgenogram from the same negative.

Electro-Therapeutical Section.

February 28, 1908.

Mr. W. DEANE BUTCHER, President of the Section, in the Chair.

The Principles of Ionic Medication.

By H. LEWIS JONES, M.D.

SINCE the publication of my papers on the treatment of rodent ulcer by zinc ions, in 1905 and 1906, I have received many enquiries concerning the principles of ionic medication, and I feel sure that great interest in the method has been excited among medical practitioners in this country. This is only natural, because the plan of introducing drugs into the tissues by electrical means appears to afford a new and useful therapeutic procedure.

The laws governing the behaviour of solutions through which electrical currents are flowing are well established, and a knowledge of these laws is requisite if one is to succeed in the application of electrolysis to medical work.

Before proceeding further with the subject of my paper I wish to draw attention to an experiment which is proceeding before you, for, in order to illustrate the movement or migration of ions I have prepared an arrangement of a conductor composed of a number of layers of parchment paper and filter paper in which conduction and ionic movement may take place in such a way as to allow of a visible recognition of the changes which occur, because I feel that in a subject like our present one an ocular demonstration is particularly useful (*see fig.*). The electrolytic circuit is composed as follows: Between the poles of the metallic part of the circuit (composed of two plates of iron) there are arranged, in a double series, first some layers of filter paper, next a diaphragm

formed of a piece of gutta-percha tissue, with a central hole of 1 cm. in diameter, next some twenty layers of parchment paper, and thirdly a considerable block of filter papers. This last body of filter papers is in the centre of the pile, with the other components arranged symmetrically on either side of it. The parchment paper portions are made up of a long strip, folded in such a way as to form a number of squares which follow each other in order when the paper is unfolded. This parchment paper has a thickness of 0.2 mm. when moist, so that the twenty layers have a thickness of 4 mm. The object of the gutta-percha diaphragm is to limit the path of the current, and therefore the stream of ions, to the central part of the parchment papers, and is introduced simply for demonstration purposes. The iron disc beneath is connected to the negative pole and the iron disc above is connected to the positive pole. All the papers are moistened with a dilute (2 per cent.) solution of a simple neutral salt. Sodium sulphate is chosen for this experiment, though any soluble salt might be used provided it were without action upon the ions under examination. As an indicator the parchment papers

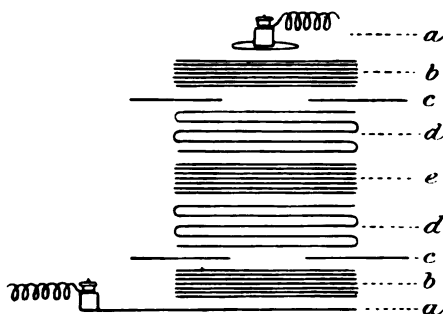
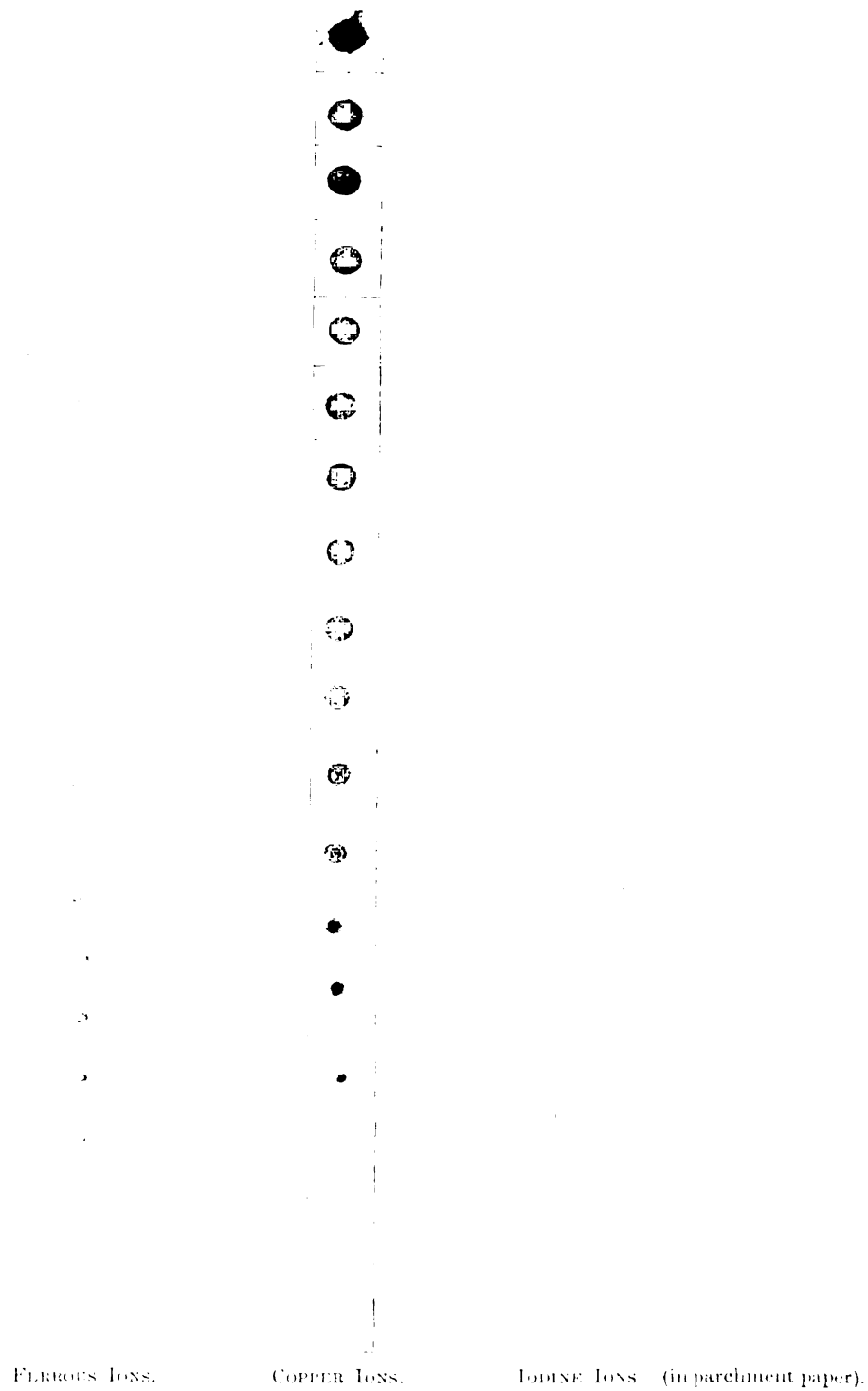


Diagram of Electrolytic Arrangement : *a*, electrode ; *b*, filter papers ; *c*, diaphragm of gutta-percha tissue ; *d*, strip of parchment paper folded into twenty layers ; *e*, filter papers.

contain a trace of phenol-phthalein, a colourless body which has the property of turning purple in the presence of hydroxyl ions.

Under the conditions just described the flow of current through these papers will set up a double movement of ions. SO_4 ions will move to the iron positive pole, which will also give off ferrous ions, and these will migrate towards the opposite pole, penetrating the layers of paper as they move. At the iron negative pole no ferrous ions will be formed, but sodium will begin to appear from the sodium sulphate of the electrolyte,



The long strip represents the packet of 20 layers unfolded after the introduction of the ions by the electric current, and "developed" by immersion in a suitable reagent, *e.g.*, Ferricyanide of potassium for the ferrous ions. The layer nearest the active electrode is arranged above for each strip.

and through a secondary reaction with the moisture present will form hydrogen, which is set free as a gas, and sodium hydrate (NaOH). The hydroxyl ions will split off from this compound and will move away towards the positive pole, and will indicate their progress as they advance through the papers by a change of colour in the phenol-phthalein. At the end of fifteen minutes I hope to demonstrate the presence of iron in the layers of parchment paper on the anode side and of hydroxyl on the side of the kathode. My reason for choosing iron as the metal to be ionised and set in movement is that iron lends itself to a demonstration of this kind by the readiness with which a colour reaction, due to the formation of Prussian blue, is given when ferrous ions are brought into contact with ferricyanide of potassium.

(At the conclusion of the experiment, which occupied fifteen minutes, the current being 20 ma., the layers of parchment paper were unfolded and showed a central red stain extending through the entire series from the kathode to the central block of filter papers. On the anode side the parchment showed no red stain of the presence of hydroxyl, but was slightly discoloured from the presence of iron ions, and after being washed and wiped it was immersed in a solution of ferricyanide of potassium, which brought out the presence of iron ions by striking a deep blue colour [*see Plate*].)

CONDUCTION IN METALS AND CONDUCTION IN LIQUIDS.

We speak of metals as conductors, and of saline solutions, solutions of acids, of alkalies, &c., as conductors, but the mechanism of conduction in these two classes of conductors is by no means identical. In conducting solutions, or electrolytes as they are called, the conduction is invariably accompanied by chemical decomposition, and in fact only occurs by means of it, and the electricity flows not through the atoms, as in a metal, but with the atoms of matter which travel along and convey their charges between the poles, for in electrolytic conduction positive electricity is conveyed through a liquid by something equivalent to a procession of the electro-positive ions (atoms or molecules) of the compound in the direction called the direction of the current (namely, from the positive to the negative pole), and at the same time negative electricity is conveyed in the opposite direction by a similar procession of the electro-negative ions towards the positive pole.

An ion signifies an atom or a molecule of a body with its electric

charge attached to it, and it differs from an element in its ordinary condition solely by virtue of this electric charge. When copper is electro-deposited from a solution of one of its salts it assumes its metallic form on being deprived of the natural positive charge, which it had in its ionic form, by contact with the negatively charged kathode of the cell. The opposite electric charges cancel out and the copper in its metallic or "unelectric" condition remains. The laws of electrolysis were formulated by Faraday and the term ion was also devised by him to express the tendency to move towards the poles of the cell which he observed in different chemical bodies. He gave the name of anions to the ions which he found to move towards the positive pole and of kathions to those which move towards the negative. He showed that the amount of chemical action produced in any solution of an electrolyte was exactly proportional to the quantity of electricity which had passed through it. The weight of substance acted on measures the quantity of electricity which had passed, and, conversely, the quantity of electricity or the magnitude of the current, with the time during which it has been allowed to flow, measures the amount of chemical change produced. He also showed that for different chemical bodies the amount of decomposition in each substance is exactly proportional to its chemical equivalent. For instance, an atom of silver is 108 times as heavy as an atom of hydrogen, and is equal to it in combining power; hence a current which will liberate 1 grm. of hydrogen will liberate 108 grm. of silver. Tables of electro-chemical equivalents have been calculated which enable us to determine the quantity of any ion set in motion from measurements of the magnitude of the current and the duration of its flow. For example, suppose zinc ions be driven into the skin of a patient with a current of 10 milliamperes for fifteen minutes, the calculation is as follows:—

The amount of zinc set in motion by a current of 1 ampere running for one second is 0·00034 of 1 grm.

0·00034 grm. for 1 amp. per second.
 0·00034 grm. for 0·01 amp. (10 ma.) for 100 seconds.
 0·00034 grm. \times 9 grm. for 900 seconds = 15 minutes.
 0·00306 grm. — 3 milligrammes.

By weighing the zinc electrode before and after an application one might be able to determine that the loss of weight during the application was of that order of magnitude, and indeed without weighing it is often possible to recognise by the appearance of the surface of the metal that there has been a loss of some of its substance. In the refining of copper

the principle of the migration of ions is employed on a gigantic scale, for almost all the metallic copper in commerce to-day has passed through the ionic form. Thus in some copper statistics for the year 1902 I read that over 210,000 tons of copper were electrolytically refined in the United States alone during that year; the whole of this mass of copper, therefore, passed into solution as copper ions from anodes of crude copper, and was deposited at kathodes in the form of the pure metal. The process is done for the purification of the copper, and also for the recovery of the gold, silver and other metals present in the crude material and these more than repay the cost of the electrolytic process.

In addition to calculations of the amount of any substance set in movement, we require, for medical purposes, to know the depth to which a drug can be made to penetrate in the time of its application. Our knowledge on this point is not yet very complete. Sir Oliver Lodge has given the following rates for certain ions when impelled by an electric pressure of one volt per centimetre: Hydrogen, 10·8 mm. per hour; K, 2·05 mm. per hour; Na, 1·26 mm. per hour; Cl, 2·16 mm. per hour; I, 2·16 mm. per hour. At higher pressures the rate is increased proportionately. In the experiments which we have just seen with the parchment paper it appears that the ions penetrated about one thickness of paper = 0·2 mm. per minute, under the conditions of the experiment.

The rates of migration through simple conductors supply only rudimentary information as to the behaviour of ions driven into an electrolyte with such a complex composition as the human body, and the question of the fate of the ions which enter the body must be considered later.

The beginnings of the use of electricity for the purpose of introducing drugs into the human body date back to 1833, when Fabre Palaprat claimed to have introduced iodine into the tissues in this way. In this country Benjamin Ward Richardson devoted a good deal of attention to electrolytic medication about 1859, in the search for a mode of producing local anæsthesia by means of solutions of aconite and of other drugs. Bruns, in 1870, introduced iodine electrically and afterwards recovered it from the urine of a patient, and Munk, in 1873, succeeded in setting up tetanic convulsions in a rabbit by using electrodes moistened with solutions of strychnine. Since that time the subject of cataphoresis, or cataphoric medication, has been studied by a great number of persons, including Foveau de Cournelles in France and Morton in New York, but

the idea was imperfectly understood, and consequently failed to attract attention and made no progress.

The establishment of the principles of ionic medication upon a clear, scientific basis has been due to the writings of Professor Stéphane Leduc, who has published a number of papers on the subject since 1900, when a paper¹ on the introduction of medical substances into the depths of the tissues by the electric current was read by him before the International Congress of Electrobiology in Paris. On January 5, 1901, he published, in the *Gazette Médicale*, of Nantes, a paper² on the theory of ions in medicine, in which the subject was carried further, and in 1903 he published a case of rodent ulcer cured by an application of zinc ions.

A very useful small work has lately appeared under the title of "L'Ionothérapie électrique," by Dr. Delherm and Dr. Laquerrière,³ in which much useful information is embodied.

There are some points in connection with the choice of drugs for ionic medication which need to be remembered. In the first place, there are chemical bodies which possess powerful effects upon protoplasm when in their ordinary elemental condition, but lose these properties entirely when in the ionic form. For instance, chlorine in its free state is a strong oxidising body and a destructive agent, but chlorine ions, which are present in abundance in normal saline solution, have no such properties, and it would be a futile proceeding to introduce chlorine ions electrically for the sake of an effect like that of chlorine water as observable in a test tube. The same applies to iodine, and, indeed, to the whole class of strong chemicals whose action depends upon their degree of concentration. Caustic potash or nitric or sulphuric acids are all powerful reagents in the chemical laboratory, but lose these properties when greatly diluted, whereas those bodies which are active in the ionic form are independent of their degree of dilution.

Again, for ionic medication one can only use such substances as undergo dissociation or ionisation when dissolved in a solvent. This excludes a number of organic medicinal compounds which are insoluble or are not dissociated when dissolved. Chloral, chloroform, ether, alcohol, phenol, camphor, &c., are instances of medicines which are not available for ionisation. Still there are a very large number of active substances which can be used. We are not limited to inorganic

¹ "Introduction des substances médicamenteuses dans la profondeur des tissus par le courant électrique."

² "La théorie des ions en médecine."

³ Paris, J. B. Baillière et Fils.

salts, because among organic compounds there are many which fulfil the conditions of solubility and dissociation. The alkaloids, as, for instance, strychnia, quinine, cocaine, aniline, adrenalin, may be used and have been found useful for ionic medication. Salicylic acid, too, and many other of the coal tar compounds, are found to exist in the ionic form.

In using electrolytic medication it is important to know which ions migrate inwards from the anode and which from the kathode. This is not difficult to learn, for the ions of all bases—that is to say, the ions of the metals, the alkalies, and the alkaloids—are electro-positive, and their ions, therefore, are repelled from the anode, and must be driven into the skin by placing them at the anode of the circuit. The acids, on the other hand, are introduced from under the kathode, and the same is the case with the halogens, chlorine, bromine, or iodine. A minor exception must be made for lead, which under some conditions migrates to the anode as lead peroxide.

The question of the amount of penetration which can be obtained is also one which requires further consideration. In particular also we have to consider the effect of the components of the juices of the body in combining with ions, and so arresting their further progress. Some ions, especially those of the heavy metals, are likely to be precipitated in the form of phosphates by the albuminous fluids of the body, although the amount of phosphoric acid in the blood-serum and lymph is very small (about 0·025 per cent. or one part in 4,000, the sodium chloride being about 0·5 per cent. or one part in 200). The other ions may be pictured as gradually losing their velocity after they have penetrated a few millimetres, and subsequently passing into the circulation gradually by diffusion, until they become eliminated.

THE STRENGTH OF THE IONIC SOLUTIONS.

I am often asked to specify the strength of the solutions employed for moistening the pads used in ionic applications. The answer to the question is that a 1 per cent. or 2 per cent. strength is the proper proportion. As a matter of fact the strength matters little. In a 1 per cent. solution there are abundant ions present to carry any reasonable medical current, and if the ion being introduced is that of a metal, such as zinc or copper, the supply of ions is continually being renewed from the electrode, in exact proportion to the number of ions moving

forward into the body. When the ion is not so renewed, as, for instance, when a carbon electrode is used, it is better to use a stronger (2 per cent.) solution for moistening the pad, and to employ a great number of layers of lint in the pad to act both as a reservoir for the solution and as an absorbent for the hydrogen or hydroxyl ions driven inwards at the positive and negative electrodes respectively. Both these ions are caustic and are the cause of the soreness which is sometimes set up at the points of contact in galvanic applications, and we have seen from our first experiment that hydroxyl ions migrate rapidly. The hydrogen ions move more rapidly still; indeed, it is with the hydrogen ions that the highest velocity has been observed.

(In a second experiment performed during the reading of the paper iodine ions were caused to penetrate twenty layers of parchment paper from a kathode, and copper ions were driven in similarly from a copper anode. The iodine ions were demonstrated with mercuric chloride, which gave an orange stain to the paper, and the copper ions with potassium ferrocyanide [*see Plate*].)

INDICATIONS FOR IONIC MEDICATION.

The class of cases for which ionic medication is likely to prove useful is to be found mainly among local disorders, for the treatment of general diseases by drugs is already fairly met by other simpler modes of administration. It might also be thought that the simple procedure of hypodermic injection might bring about the same results in local medication as can be obtained by the somewhat complicated method of driving in ions electrically; but there is this difference, and I consider it an important one. The injected fluid enters the interstices of the tissues, and from there is rapidly carried away into the general circulation, while the ions introduced electrically penetrate into every conducting element of the tissues—that is to say, into the actual protoplasm of the cells of the part traversed by the current. This is not merely a theoretical consideration, for it has been found that cocaine and adrenalin introduced in the ionic form produce a physiological effect which is more durable than that obtained by the method of injection, although the quantity of the drug conveyed into the system by an injection may be by far the greater. I have myself noticed that the effect produced upon a rodent ulcer by zinc ions continues for a long time, as though the zinc were locked up in the part treated. It has also been observed with lithium

that after its electrical introduction into the tissues its elimination by the urine is extended over a longer time than is the case after oral administration.

Next, the conditions for which ionic medication is attempted should be superficial conditions, so as to ensure that the ions employed shall really penetrate into the parts submitted to treatment, and shall be carried by the current into the whole thickness and the whole area of the diseased part.

The number of local and superficial morbid conditions which are still without any satisfactory means of cure is a large one, and instances of various kinds will readily occur to each one of you. I am sure that it is of the highest importance for the success of ionic medication to commence with the attempt to treat superficial conditions only, and even with superficial conditions to take plenty of time so as to ensure as far as possible an effective permeation of the part treated with the drug employed. I am sure that an important cause, and perhaps the most important cause, of non-success is due to neglect of this important point. It is the slowness of the ionic movement, and also the fact that the procedure of ionic medication is apt to be painful, and so is likely to cause the operator to cut his time too short, which are the stumbling blocks of the treatment, and I believe that when we have perfected our technique by further experiment we shall often employ ionic medication under local or even general anæsthesia with larger currents, and for longer times of application. The times and magnitudes of current which I have given hitherto for the treatment of rodent ulcer by zinc ions, namely twelve minutes and 3 ma. per square centimetre, are an irreducible minimum, and both time and current strength may usually be increased with advantage.

RODENT ULCER.

The disease for which ionic medication has proved most successful so far is rodent ulcer treated with zinc ions. This application of ionic medication was indicated by Leduc in 1903, when he reported a case of the kind successfully treated by himself. Since then I have given a good deal of attention to the treatment of rodent ulcers in this way, and I consider the method to be valuable and to have given electro-therapy a new procedure of first-class importance.

With certain limitations, the treatment of rodent ulcer by zinc ions is uniformly successful when applied in the early stages of the disease, but

I have not yet learned how to cope with the extensive and appalling examples of old neglected rodent ulcers which are seen from time to time.

The procedure for the treatment of small rodent ulcers is quite simple. The surface is covered by three or four layers of lint wet with a 2 per cent. solution of the sulphate or chloride of zinc; a zinc electrode of suitable size is applied and connected to the positive pole of an ordinary medical continuous current battery, the circuit is completed through a second indifferent pad electrode, and the current turned on to 5 ma. to 10 ma., and kept on for fifteen minutes. The magnitude of the current must be proportionate to the size of the area, and Leduc has suggested 3 ma. for each square centimetre. On the face this magnitude can usually be tolerated well, but, if desired, a little cocaine can be introduced first by proceeding identically as described for zinc, but with the positive pad moistened with cocaine hydrochlorate.

Zinc ions are also useful in other superficial suppurative conditions. In a case referred to me as lupus, but which I believe was merely pustular eczema, the patient had two distinct purulent crusts upon the side of the nose. One of these was treated by the zinc method while the other was left alone. At the end of a week the one treated had completely healed, the untreated spot remaining as before. Zinc was then applied to the second place and the same result followed, viz. : complete healing within seven days. It is probable that zinc ionisation might prove useful in many forms of ulceration of the skin and mucous membranes, certainly it should be tried in some of these conditions. Ionic medication has also been used for the sterilisation of teeth, and I have lately met a dental surgeon who told me that he frequently employed the method.

DIPHTherITIC FOCI.

The following case of the treatment of a diphtheritic infection is very suggestive. In a case of diphtheritic paronychia the finger-nail had been removed, but it had not been found possible to eradicate the diphtheria bacillus, which lurked and grew in the irregularities of the skin in spite of antiseptic lotions. The case proved obstinate, and had gone on for several weeks. By means of some layers of lint moistened with ammonio-sulphate of copper and an anode in the form of a coil of copper wire wound round the finger-tip, copper ions were introduced for fifteen minutes, and in less than a week the patient was entirely well.

OTHER SEPTIC CONDITIONS.

The employment of ionisation to introduce an antiseptic into the walls of a sinus or into the base of an ulcer will readily suggest itself, and I have had an instance myself in which an obstinate ulceration of the mouth yielded to copper ionisation, while a friend of mine has told me of a case in which an ulcer of the rectum, of long standing, healed up well after ionisation with zinc.

CORNEAL ULCERATION.

In one case of this troublesome affection the zinc applications proved quickly successful, but in another, lately submitted to me, I met with no success, the failure in my opinion being the result of too short an application, as referred to in my remarks just now.

WARTS.

In the treatment of multiple warts of the hands I have found magnesium ions very effective, so much so that I have several times seen all the warts disappear from a hand after two applications of magnesium ions. These can easily be applied from a solution of magnesium sulphate, using a carbon electrode with a thick pad of lint to hold sufficient solution. A magnesium metal electrode can also be used, and I have on the table such an electrode which has been made for the purpose. I have not found that all warts disappear so easily by magnesium treatment, and for hard solitary warts I prefer to use zinc ions, and to ensure the penetration of the metal by using a zinc needle to transfix the wart. A current of 2 milliamperes for two minutes will usually suffice in this case.

LUPUS.

This is a disease which naturally occurs to one's mind in connection with ionic medication. It is superficial, accessible in most instances, has no great mass or thickness, and, therefore, fills the requirements for ionic action admirably. But I have found it extremely difficult to eradicate lupus in this way, though I have had a few minor successes. Aniline and zinc have both seemed valuable, but further perseverance, and the

discovery of a more effective ion are needed before we can count lupus as a success for ionic medication. Aniline has a high chemical combining weight = 94, and, therefore, a larger quantity is carried in by a given current than is the case with zinc and copper, whose equivalents are for zinc 32.5, and for copper 31.5. Accordingly with aniline hydrochlorate a current of 10 ma. for ten minutes will introduce 6 mg. of aniline ions.

COCAINE.

The introduction of cocaine ions will render a small patch of skin insensitive in about five minutes, and I have frequently used it as a preliminary to small cosmetic procedures of electrolysis for the removal of xanthelasma, small nævi and moles on the face. The introduction of cocaine will also relieve the pains of neuralgia temporarily, and in some instances one or two such applications may be followed by a complete disappearance of the neuralgia. My friend, Dr. Samuel Sloan, of Glasgow, writes me regarding the application of ionic medication that a patient with supra-orbital pain of a severe periodic character coming on daily, at the same hour, was not only relieved by the introduction of cocaine ions, but that after two or three applications, using about 3 milliamperes for ten minutes on each occasion, the neuralgic pain entirely disappeared.

DISCUSSION.

Dr. LEWIS JONES, after reading the paper, added that, apropos of neuralgia, a number of observers on the Continent had reported good results in trigeminal neuralgia after the introduction of quinine in some cases and salicylic acid in others. He had had good results with salicylic acid from a solution of salicylate of soda. It was quite possible that the drug, when introduced over the area of the distribution of the nerve, might be absorbed by the lymphatics of the nerve trunks, and so conveyed to the Gasserian ganglion. Although this method was new, a number of cases of serious trigeminal neuralgia had been already reported to have been completely cured or greatly improved, and he considered that the method deserved further examination in this troublesome condition.

The PRESIDENT (Mr. Deane Butcher), in opening the meeting for discussion, said that they had listened with a great deal of interest to Dr. Lewis Jones, who, as the exponent of ionic medication, held relatively the same position in England as was held in France by Professor Leduc, and in America by Dr. Morton.

Dr. W. IRNSIDE BRUCE thanked Dr. Lewis Jones cordially for the interesting paper he had read to the Section. He (Dr. Bruce) could not say that he had had a great experience with ionic medication, but in such experience as had fallen to his lot he had found the method of treatment entirely successful.

Mr. FREDERICK C. WALLIS said that the subject was one of extreme interest to him in connection with his study of various forms of ulceration at the lower end of the alimentary tract. He was rather limited in any observations he might make because he and a colleague had a paper already written on this subject, and if he told the full story of their results that evening it would lessen the interest of the paper when it was published. But he might say that certainly so far as their experience went the treatment had met with marked success. For some years he had been looking for an effective treatment for such forms of ulceration of the large bowel. He had tried other methods with only limited success, and the removal of the diseased part by means of the knife was only possible in a small number of cases; but in those cases—they had not a large number yet—in which ionic medication had been tried the success, particularly in regard to one instance, made one quite enthusiastic as to the possibilities of curing this form of ulceration, which hitherto he had been unable to cope with. This form of ulceration was largely progressive by submucous filtration. It did not belong absolutely to the superficial class of cases which Dr. Jones insisted should be the one mainly tried, and the interesting question was as to whether it was possible to drive the metals or ions through sufficient depth of tissue to frustrate the further progress of the disease in the submucous tissue.

Dr. E. S. WORRALL said that whenever Dr. Lewis Jones read a paper it was sure to be worth listening to, and they were not disappointed on this occasion. The speaker had been using this treatment in a considerable number of cases and had found no great difficulties in the way of its application. It had been used with uniform success in a variety of cases, excepting only some cases of ringworm in which he had tried copper ionisation without success. Certain practical difficulties had arisen in treating some of the cases. Some of the patients would endure the burning sensation caused by this process better than others. The position of the part affected also had some influence. The patients would stand the burning near the angle of the mouth better than on the tip of the nose. Dr. Jones spoke of the treatment of corneal ulcer. What intensity of current was given in such a case? In a case of rodent ulcer affecting the lower lid he (Dr. Worrall) did not feel justified in applying the current of 3 ma. per square centimetre. He applied a milder current, giving eight applications of ten minutes each at intervals, and the result at the end of the treatment was all that could be wished. Sometimes one could use the current at the density specified and the patient would not complain, but in many other cases the patient would not tolerate such a current. Recently he treated a case of rodent ulcer by driving in a 10 per cent. solution of cocaine hydrochlorate in guaiacol for five minutes, and then proceeded with the zinc ionisation to the full strength of the current, which could be readily tolerated after driving in the cocaine.

Dr. DONALD BAYNES said that he was specially glad to have had the opportunity of listening to Dr. Lewis Jones's excellent paper, and to have something other than X-rays brought before the Section. Sometimes at previous meetings he had thought that the old British Electro-Therapeutic Society had become since the Amalgamation part and parcel of the Röntgen Society. Dr. Jones thought that ionic medication was specially adapted—indeed, one gathered from his paper that it should be used only—for superficial conditions. Would it not be ionic medication, however, that they had in the treatment of joint affections when using iodide of potassium, &c., in cases of arthritis? Certainly a benefit was obtained from using it, and in these cases one required to have deep penetration. Again, in the use of a copper plate connected to a positive pole in cases of threatened appendicitis; here there must be fairly deep penetration to relieve the pain, and the pain is not relieved by the current without the copper plate. He had never tried ionic medication in any such condition as ulcer of the cornea, and was rather inclined to be afraid of using the continuous current to the eye, because the eye was more or less composed of fibrous tissue, which the continuous current had the effect of dissolving to some extent. He desired to have Dr. Lewis Jones's opinion on that point, for Dr. Jones had had a very considerable experience in this method of treatment. One speaker had mentioned the pain caused by the application of the current and the objection made to it by some patients. To overcome the difficulty it had been suggested by the speaker that cocaine might be introduced from the positive pole to prevent the pain. He found that if cocaine were injected hypodermically the patients felt less pain than when it was introduced cataphorically. But in cases of sciatica, &c., where Dr. Jones had given cocaine hypodermically, it appeared that the effect was not lasting. That was so to a large extent unless care was taken to cut off the circulation by means of an Esmarch bandage, &c. If the circulation in the part were cut off before injecting the cocaine the effect would be found to remain.

Dr. BOLTON (Nottingham) said that he was glad Dr. Jones had referred to the treatment of affections of the joints because that was the only department of this subject upon which he could offer an opinion. He wondered whether Dr. Jones out of his experience could explain the effect he had noticed in the treatment of rheumatoid arthritis. He found salicylate of soda by itself to have but little effect, and the same was true of the high frequency current. The case would improve for a fortnight and then come to a standstill. If, however, he gave salicylate of soda by the mouth, and immediately followed it up with high frequency the improvement was manifest. It was possible that by using the electrical treatment and the salicylate together the salicylate was driven deeper into those parts of the joints which could not be reached without the electrical treatment. Benefit was obtained from the two together which could not be obtained from either singly.

Dr. J. F. HALLS DALLY said that he could only echo the remarks of the preceding speakers in thanking Dr. Lewis Jones, of whom he would like to ask two questions, viz.: whether he had tried ionic medication in cases of irritative

skin conditions such as pruritus, also whether he had tried it in neuralgias apart from those of the face.

Dr. E. G. GRAHAM LITTLE said that they had reason to thank Dr. Lewis Jones for introducing this system to England, and in view of its special efficacy for superficial diseases dermatologists were most particularly indebted to him. He asked whether this method could do any harm to the tissues which were not diseased in cases in which it was not easy to fit the apparatus solely to the diseased part. In the case of a small lupus, for instance, would harm result if the treatment went beyond the diseased area? Would there be any risk whatever of permanent venous dilatation or anything of that sort? He suggested that possibly hydrogen peroxide might be used as a bleaching agent in chloasma. The treatment might be tried in histologically superficial diseases of the skin, such as psoriasis, which was often obstinate. Had Dr. Lewis Jones any suggestions to offer as to the method of choice of the electrolytic fluid? Was there any difference in using a zinc as against a copper solution in cases of ringworm? On what principle were they selected? If there were any technical points influencing the selections it would be very useful to know them. He had at present a case of very persistent erythema with local dilatation of the superficial blood-vessels which it was extremely difficult to treat by any method at his disposal. He now thought of trying suprarenalin ionisation. He concluded by expressing the thanks of dermatologists to Dr. Lewis Jones.

Dr. A. H. PIRIE said that it was eight years since, in Dr. Lewis Jones's room, he learned the method of driving in the cocaine. On two or three occasions he had used copper sulphate solution for ringworm, and after about three weeks succeeded in getting a great improvement. But on looking carefully he found that two or three hairs had escaped the cure, and that seriously reduced the value of the treatment to his mind. The way in which the patches cleared was remarkable, but a few hairs always seemed to spoil the treatment. In a case of rheumatism in which the patient's wrist had been badly swollen for about four months he applied by the ionic method a 2 per cent. solution of salicylate of soda for about an hour. After the first treatment the swelling was reduced by $\frac{1}{2}$ in., and after a second treatment by another $\frac{1}{2}$ in. It was remarkable how the swelling went down with salicylate of soda ions after the disease had continued for so long a time.

Mr. T. J. P. HARTIGAN said that the form of treatment they had had brought before them that evening was one which he had been prescribing for something like six months, and in some respects it was disappointing, in others encouraging. He had no experience, or very little, of its usefulness in the treatment of rodent ulcer, and in certain situations, *e.g.*, the eyelids, he could conceive that it would be attended with a certain amount of pain that might be unendurable unless means were taken, such as the use of cocaine, to relieve it. His experience of rodent ulcer was confined almost exclusively to the radium form of treatment, and the results so far, except in extensive cases involving

bones, left nothing to be desired. In saying this he did not mean to detract from the merits of ionisation. There was no doubt that such treatment also was attended with very excellent results. With regard to ulcers in other situations he had treated varicose ulcer of the leg by the ionic method and thus far had obtained very fair results; the wounds seemed not only to clean up better but also to heal appreciably faster, and usually the patient came back to say that he felt a great deal better. In minor affections, particularly of the face, necessitating a trifling operation, the previous introduction of cocaine by this method was of material assistance. Considerable pain was caused by the performance of electrolysis and could be similarly combated. Only the previous week, for the sake of demonstration in a small operation for nævi upon a boy, he had treated one part with cocaine and left the other alone, but it was found necessary to anæsthetise the latter also before the operation could be completed. At the Blackfriars Hospital they had not had the results which might have been expected in the treatment of psoriasis; possibly they had not persevered as much as they ought to have done. The greatest successes which seemed to have attended their efforts had been in the application of this treatment to lupus erythematosus. He brought before the notice of the Dermatological Section at its last meeting four or five cases, and in every case in which the ionic method had been applied the patient's condition had been attended with marked improvement. One woman had the disease fifteen months, affecting the whole of the nose. She was treated last October, and now, except for a superficial scarring, it was hardly possible to tell that she had suffered from the disease. In another case, that of a lady who had had the disease for fourteen years, it was hardly possible to recognise where the patches had been in the parts to which the ionisation had been applied. He leaned towards copper rather than zinc in lupus erythematosus cases so far as his experience had gone. He believed that the method had a future before it and was worthy of an extended trial.

Dr. G. B. BATTEN said that he supposed many experiments had been carried out in the past with regard to the voltage used and the rate of entry, and it would be interesting to know whether it was recommended that to get in, for example, the same amount of zinc, a higher voltage should be used for a shorter time or a lower voltage for a longer time. Most of those who treated ringworm in that Section used X-rays, but there was a class of cases of ringworm of the scalp, consisting of small, disseminate patches, which was tedious to treat by the X-rays. It would be useful to know whether metals or salicylates were the more promising for ringworm treatment, also whether boils had been sterilised in this way. He also asked whether the cocaine must be in a special solution or could be used simply with water. One member had spoken of the effect of high frequency currents in driving salicylates into the joints. Dr. Clarence Wright once read a paper on that subject before the old Society, and suggested the use of the high frequency current electrolytically. The use of high frequency under such conditions would possibly be a great deal less painful than the constant current.

Dr. LEWIS JONES, in replying, wished first to thank Dr. Pirie, on behalf of those present, for the skilful way in which he had performed the experiments designed to demonstrate the movement of the ions through the layers of tissue. He thanked Dr. Graham Little and Mr. Hartigan for their useful suggestions as to certain new lines of work. His own experiments with lupus erythematosus had been disappointing, but after hearing the remarks of Mr. Hartigan he would try again. Evidently he had not learned how to deal with them in the way Mr. Hartigan must have done. Dr. Graham Little had enquired what sort of principles guided them in the choice of this or that drug. The principle was to determine which was the active ion in any drug and to introduce it in the ionic form. In some cases, such as the treatment of warts by magnesium, he had observed notes in the medical journals to the effect that after the administration of magnesium internally, warts had disappeared. This made him think that if magnesium had that effect when given as a drug it would be better accomplished by the regular introduction of magnesium ions into the warts themselves. In the case of ringworm there were serious difficulties, and although at one time he had proposed to write a paper on its ionic treatment he had been compelled to withdraw from that position, for although improvement and new growth of hair could readily be obtained by the introduction of the ions of zinc or of copper, yet the actual curing of a case of ringworm was a different matter. Some infected hair follicles escaped, and even if it were possible to sterilise nine-tenths of the affected follicles by zinc or copper it was all of no value if the remaining one out of the ten remained unsterilised. If they could succeed in causing the ions to penetrate uniformly into all the follicles the conditions of ringworm treatment would be comparatively simple. It was just this difficulty which had been experienced in the past with other medications for ringworm. As to the most suitable ion for the purpose, zinc and copper seemed to act well, but their solutions were astringent fluids, and perhaps salicylic ions from a solution of salicylate of soda might have a greater tendency to soften the epidermal tissues and to penetrate better and more uniformly. Another serious difficulty in the application of the ionic method to ringworm was the necessity of treating the whole scalp, and over such a large area a current of 3 ma. per square centimetre was a large current for a child to bear. Sycosis could be successfully treated by an electrolytic procedure by introducing a fine copper wire, connected to the positive pole, into each of the suppurating follicles. This was rather tedious, but seemed to answer well, especially if combined with careful cleanliness of the skin, so as to avoid the reinfection of fresh follicles. Mr. Hartigan's remarks about varicose ulcers were interesting and valuable. About rheumatism he had not very much to say at present; the very vagueness of the term made definite statements difficult or impossible. In the case of a woman who had hydrops articuli of both knees he had tried the effect of iodine, introduced from the kathode, and of lithium, simultaneously introduced from the anode, the electrodes being two pads, applied one on either side of the joint. For purposes of experiment it might have been better to have applied lithium to one knee and iodine to the

other, but as it happened both were introduced into the same joint. The effusion in the joint rapidly disappeared after a single application and the joint became normal, and the same treatment then being applied to the other knee a similar result followed in that one also. Therefore, though he had failed to discover whether it was the iodine or the lithium or the combination of both which produced the good result he had at least obtained a curative effect. With regard to the treatment of neuralgia he had not as yet had a very extended experience, but if the treatment proved to be really useful in trigeminal neuralgia one might expect it to be equally useful for the other forms of neuralgia, which were generally simpler in their nature and easier to treat.

Electro-Therapeutical Section.

March 27, 1908.

Mr. W. DEANE BUTCHER, President of the Section, in the Chair.

Cauterization as an Adjuvant to Radiotherapy.

By J. GOODWIN TOMKINSON, M.D.

THE clinical forms of cutaneous tuberculosis in which I have employed X-ray therapy in conjunction with cauterization have been so far the non-ulcerative and ulcerative forms of lupus vulgaris and tuberculosis verrucosa. In the main my remarks will bear upon the treatment of lupus vulgaris to which for some time I have been devoting considerable attention. It is from the standpoint of the dermatologist that I would direct your attention to the question of therapeutics, and in so doing would claim neither the X-rays nor the Finsen light as the only method at our disposal for the treatment of lupus vulgaris. With your permission I will briefly refer to one or two of the older methods employed in the treatment of this form of cutaneous tuberculosis. One of these stands out with conspicuous prominence, and justifiably so, on account of the excellent results obtained by its exhibition in extensive facial lesions of an ulcerative and hypertrophic character. I refer to that of multiple linear scarification, especially associated with the French school of dermatology, much practised and recommended by such authorities as Brocq and Hallopeau, the latter of whom strongly advocates, in addition to the scarification, the application of a 5 per cent. aqueous solution of permanganate of potash. In this country an objection to this treatment is the necessity for repeated general anæsthesia, which, although quite well induced by nitrous oxide, might not commend itself to every patient. In Paris it is no unusual thing to see patients in the skin clinics

submit to this treatment with a surprising and enviable stoicism without the employment of any anæsthetic, local or general.

As the most common site of lupus vulgaris is the face, often the nasal region, surgical interference is contra-indicated, save in lesions of extremely limited dimensions. This restriction does not, of course, apply in the same degree to lesions on covered parts.

Scraping in lupus vulgaris of non-ulcerative type is strongly recommended by Brocq, and justifiably condemned in ulcerative lupus, where it may be followed by most unsightly cicatrices and conspicuous disfigurement.

With respect to the galvano-cautery, it may be said that while of considerable value in isolated lesions, such as those appearing in an old cicatrix or persisting from inefficient curetting, it should be used with great caution in the vicinity of orifices, where vicious cicatrices may be thereby very easily induced. It is not recommended in such cases; in fact, for the reason just stated it is distinctly contra-indicated. It is, however, of considerable value, and is much employed in lupus of the palate, pharynx and mucous membranes generally.

In concluding this cursory review of the relative merits of some of the various methods of treatment other than actinotherapy and X-ray therapy, I would recall to your memory that method associated with the name of Hollander, of Berlin, in which a stream of air heated to some hundreds of degrees Centigrade is directed upon the lesion with the production of an eschar, which is subsequently removed by scraping. At the conclusion of a visit to Berlin I had the pleasure of manipulating Hollander's apparatus under his supervision, but was unable personally to follow up the case treated. Hollander claims, however, most excellent and rapid results from his treatment when properly carried out.

At the Paris Congress on Tuberculosis, of which I was a member, much time was occupied with communications dealing with the value of the newer methods—phototherapy and X-ray therapy—compared with that of the classic ones of multiple scarification, physical and chemical cauterisation, &c., employed in the treatment of lupus.

While the older methods had strong support from more than one authority of eminence, the consensus of opinion of those who had had practical experience of the newer methods was that the Finsen method gave the best results. The adverse opinion of that method was largely determined by its costliness and the prolonged treatment involved. Opinions with respect to the X-rays were in the main only in favour of their exhibition as an adjuvant to phototherapy.

In reviewing the results of 633 cases treated at the great Paris Hospital of Saint-Louis, my friend and master, Professor Gaucher, said: "Phototherapy gives very good results in the two varieties of lupus. It has the merit of giving in general beautiful cicatrices, but it is a long and costly process, not within the reach of everybody, and it is not applicable to every region, in particular to cavities and mucous membranes. The Finsen method remains at present the best. Radiotherapy has an analogous action, but more intense than phototherapy, upon tuberculous lupus. It is more difficult to control."

While everyone must admit the high value of the Finsen method, of which the resulting cicatrix is unsurpassed from the æsthetic point of view—in fact, from every point of view—yet anyone at all experienced in phototherapy will have found that the great length of time involved in the treatment of extensive lesions is a great drawback to its value. In fact, in hospital practice a large number of cases are of such dimensions that phototherapy would be an almost interminable process, and in many instances an almost impracticable one from the social position of the patient, who, unless accommodated in a hospital, would be unable to attend until a cure was effected.

About two years ago I began to use the X-rays more frequently for the treatment of lupus vulgaris with the object of diminishing the length of treatment, and found it was possible to obtain in ulcerated and hypertrophic cases a relatively rapid response, culminating in a smooth and flexible cicatrix free from the disfiguring keloidal developments not infrequently following treatment by some of the older methods.

Keeping in view two objects—relative shortness of treatment and æsthetic effects—I have been employing for facial lesions a *combined method of treatment*—i.e., cauterization and X-ray therapy—which, so far, has given very encouraging results. In brief, the method is as follows: If any crusts exist they are removed by the application of a salicylated ointment. A tentative X-ray exposure of from three to five minutes is made upon a small area of the lesion. In a few days the X-rays are directed for from three to five minutes daily upon a somewhat wider area of the lesion, unless contra-indicated, until the whole lesion has been exposed some three or four times. It is then plastered with Unna's 50 per cent. salicylic acid and creosote pflastermulle, which is renewed daily. If its application be badly borne, the part is previously swabbed with 10 per cent. to 20 per cent. solution of cocaine. In a variable number of days—approximately about ten, and determined by the individual case—it is found that much of the tuberculous tissue has

come away. The lesion is then swabbed with cocaine solution, dried, and afterwards painted with the following preparation :—

R—Ac. carbolic	...	...	...	50 per cent.
Ac. lactici	...	...	...	15 „
Ac. salicylici	...	...	...	15 „
Alcohol abs.	...	...	...	20 „

(well agitated before application as there is a considerable sediment). A few minutes afterwards the lesion is painted with the following solution :—

R—Ac. carbolic	...	...	...	80 per cent.
Alcohol abs.	...	...	...	20 „

(the formula employed in Billet's phenol method).

In very extensive cases a part only of the lesion is cauterized, the remainder being cauterized on one or more subsequent occasions. However, a whole cheek may be done at one time. More than once I have cauterized both cheeks and nose at one and the same time. I do not, however, recommend such extensive cauterization on account of the associated oedema, which it is well to avoid. After cauterization the part is dressed for a day or two with sterilised lint and carbolic oil (1 in 30), and, thereafter, with 20 per cent. aqueous solution of ichthyol until healing—usually relatively rapid—has taken place; or in some instances the application of the ichthyol solution is deferred until the lesion has been replastered and recauterized, perhaps three or four times. After healing in the manner just described, which may be accelerated by bathing the part at the time of dressing with a little of the ichthyol solution, to which 25 per cent. to 50 per cent. of methylated spirit has been added (cocaine swabbing is indicated), X-ray treatment is recommenced, short exposures of from three to five minutes—rarely longer—being made. At the end of three or four months the treatment is discontinued for a considerable time, during which the patient returns periodically for inspection. At the end of this interval in the treatment—some months in duration—the patient is submitted to the second course of treatment, which is repeated after another interval if necessary.

It should be mentioned that the patient, during the interval just referred to, is sometimes instructed to use a mercurial ointment or lotion, also that it is usual, prior to the dressing of the lesion, to clean it up with a solution of perchloride of mercury (1 in 500).

Whenever indicated, local treatment is supplemented by the exhibition of hæmatinics, ol. morrhua, and saline aperients, and a generous diet and residence amidst hygienic surroundings are enjoined.

With reference to the X-ray apparatus a 10 in. coil is used. The diseased area is exposed at a distance of about $7\frac{1}{2}$ in. from the anti-kathode of a medium to soft tube, while the parts not under treatment are protected by a lead glass diaphragm to which funnels of the same material and of various sizes, allowing exit to the rays, are attached. This method is slightly varied in some cases, the most important modification being the submitting of the lesion to the X-rays during the period of plastering and cauterization, with, I think, better results. Obviously this modification calls for the exercise of great caution.

What are the disadvantages, if any, in the employment of X-rays in this method? Too long and careless exposure may induce a radio-dermatitis, which, if severe, will not only occasion the patient considerable pain, but prove extremely difficult to heal. It will be noted, however, that the individual X-ray exposures are short. No attempt is made to produce a radio-dermatitis, *and the periods during which they are exhibited are not over-prolonged*. It is, I venture to think, by small dosage and lengthy intervals of rest, and so attempting to prevent the onset of cutaneous X-ray intolerance, that the best therapeutic action of the X-rays in lupus vulgaris will be obtained.

(Here a series of photographs was shown.)

In a discussion at the annual meeting of the British Medical Association held at Exeter last August—in which I had the pleasure of taking part—the question of epitheliomatous degeneration in lupus scars which had been treated with the X-rays received some attention. While not prepared to say it may not occur, I have not had as yet any case to record. And in reference to this it should be borne in mind that epitheliomatous degeneration in lupus scar tissue following other methods of treatment is a generally recognised complication.

What may be said in recommendation of this method? The aim in treating facial lesions is obviously the production of a cicatrix approximating in character to the normal skin; in other words, one which is smooth and flexible and with no marked tendency to contract. The caustic element in this treatment is by no means drastic and is little calculated to produce vicious cicatrices. Indeed, in cases where cicatricial hypertrophy existed (primary or the result of previous treatment) marked diminution in the scar tissue was recorded, doubtless due in a large degree to the influence of the X-rays, the tendency of which to reduce keloidal tissue I have also observed in dermatitis papillaris capillitii, the acne chéloidienne of French authors.

The cicatrices resulting from this combined method of treatment are

smooth and flexible—a recommendation not to be ignored when deciding upon the treatment to adopt in lupus affecting the various orifices; very occasionally I have observed in them trifling telangiectases, and in one or two cases I have noted a few pigmented spots.

Lupus secondary to tuberculous adenitis has responded well to this treatment, largely due, no doubt, to the beneficial effects of the X-rays upon the underlying primary affection. In non-ulcerative lupus vulgaris it is suggested that the epidermis may to some extent interfere with the therapeutic action of the X-rays upon the underlying corium. Assuming such to be the case the action of the salicylic acid and creosote plaster-mulle is to remove this obstacle, while the action of the caustic preparations is to shorten the period of treatment by direct caustic action and the associated reaction of the tissues. All the cases submitted to this combined treatment have responded more or less favourably to its exhibition. Its greatest recommendation, however, is the relative rapidity of improvement in extensive lesions of an ulcerative or papillomatous type, where usually after three months treatment a patient is enabled to return in comfort to his occupation for a quite considerable time before the commencement of a second course of treatment.

Many cases of markedly rebellious character and of many years duration have yielded so well that one might hope, without being too sanguine, that in some of them, at least, complete cessation of the tuberculous process might ultimately be recorded.

DISCUSSION.

The PRESIDENT (Mr. W. Deane Butcher) considered that Dr. Tomkinson's treatment was a somewhat novel and energetic one: the lupus was attacked, as it should be, on every side, with horse, foot, and artillery. He had hoped that a cauterization method brought forward for the consideration of the Electro-Therapeutical Section would have been a physical and not a chemical one. Perhaps those who took part in the discussion would give their experience of other methods of electrical cauterization, cauterization by means of high frequency sparks and the like. Dr. de Keating Hart's method of sideration or fulguration by means of high frequency sparks was attracting some attention in Paris at the present time. In this method of cauterization by high frequency there appeared to be a selective action on the diseased tissue. The sparks seemed, as it were, to seek out and destroy the diseased cells, sparing to some extent the healthy tissue. The combination of cauterization with X-rays was of very great importance, since the primary action of the X-rays was not a destructive one. Some recent observations appeared to show that irradiation of

the glands of the diseased area was followed by amelioration both of cancer and lupus, even when the lesion itself was not irradiated. Mixed cases of lupus and syphilis did admirably under X-ray treatment. In such cases the high frequency spark as a means of cauterization had advantages over the salicylic or other method of chemical cauterization. In slight cases the sideration might be carried out without anæsthetics. The high frequency sparks appeared to control bleeding, and there seemed to be a selective action upon the diseased tissue without so much destruction of the healthy parts. He wished to draw attention to the unsatisfactory results of surgical intervention in the removal of the affected glands. If the glands were removed in lupus of the face or neck, action of the X-rays was hindered and the chances of recovery were greatly diminished.

Dr. DAVID ARTHUR said that he had greatly appreciated Dr. Tomkinson's paper, but he had imagined that, coming as Dr. Tomkinson did from a place like Glasgow University, he would have considered the subject more thoroughly from the pathological standpoint. The work of the X-ray department was inclined to be too empirical. They did this and that and gave no reason for the choice of a particular method. At least they should have a provisional pathology; one that had to be altered would be better than none at all. He suggested that instead of giving particulars as to the treatment of lupus by cauterization and the X-rays they should apply themselves to considering the question as to how the cauterization acted and how the X-rays acted. A most fruitful subject for consideration would be the absorption of neoplasms by the X-rays. They knew that if the X-ray treatment were pushed far enough the cells of new tissue would all be absorbed or destroyed somehow or other. Take, for example, a pathological specimen of rodent ulcer; after treatment the pathological conditions had gone. In his (Dr. Arthur's) opinion the hyperæmia produced by the X-rays gave rise to a localized leucocytosis, and the more recent growths were absorbed in preference to the older and more developed ones. There were several ways of producing cauterization—X-rays, high frequency sparks, or chemical cauteries—but if it was the case that the X-rays produced a local leucocytosis in which the newer growths were more or less absorbed, it would be best to produce the cautery action by that means. For some time in his own cases he had been purposely producing a dermatitis as fast as he could, and he had found that such a plan reduced the time of treatment by over 100 per cent. It was now quite a common thing to have cases heal twice as quickly as heretofore. Now, a theory which might have to be modified was better than no theory, and therefore he put forward his own view as to what happened in such cases. A patient who had a port-wine nævus on the face was treated by the X-rays; a strong dermatitis was produced and the part improved considerably in three sittings. A month or six weeks afterwards it had improved to such a remarkable extent that the patient thought he would like to undergo another term of treatment in order that it might be removed completely. But after the second series of X-ray applications it got worse instead of better. The reason in his (Dr. Arthur's) opinion was that the

dermatitis produced a certain amount of connective tissue. The second application of the X-rays in some way or other absorbed the connective tissue, and therefore the lesion came back. His chief point was that it would be better to spend more time with the microscope in studying the pathology of such cases than to gather so many empirical ideas which might be right or might be wrong.

Dr. ROSS (Naval Hospital, Chatham) said that he had been interested in some remarks of Dr. Tomkinson's with reference to syphilis in the Services. He (Dr. Ross) had had a little experience with that disease as he was at present stationed in a naval hospital. He had found X-rays useful in the treatment of tertiary syphilitic affections of the skin, especially in those cases which were obstinate to ordinary local applications and general treatment. In speaking of his case of the girl who was treated for lupus vulgaris, Dr. Tomkinson did not, he thought, lay sufficient stress upon the hereditary syphilitic element in the case. Of course the element of lupus came in, but the syphilitic basis ought to be taken into account. The fact that the cases yielded to the X-rays did not disprove their syphilitic character. One of his own patients with a decided syphilitic history was recently under treatment for ulceration and thickening of alæ and septum nasi. The lesion was apparently a specific one, but it did not respond readily to antisyphilitic treatment. X-rays, however, rapidly effected a cure. The lesion in this case was somewhat similar in appearance and situation to that of the girl mentioned by Dr. Tomkinson. The photograph of the girl, he thought, showed distinct traces of hereditary syphilis.

Dr. W. IRONSIDE BRUCE said that his own experience of the treatment of lupus with the X-rays was somewhat limited, but he had been very much interested in noticing that in some cases the continued irritation of the skin by X-rays for the treatment of lupus resulted in the development of rodent ulcer. He was of the opinion that the rodent ulcer had been produced as a result of chronic X-ray dermatitis. If X-ray dermatitis could be prevented from occurring the possibility after prolonged X-ray exposure of rodent ulcer appearing was not likely. He knew of one case where without doubt after a prolonged exposure to X-rays for lupus rodent ulcer made its appearance. He had been interested to notice the length of time which Dr. Tomkinson allowed to elapse between the exposures. He supposed that in exposing lupus in the ordinary way to the X-rays one should allow a like period of rest to elapse between the exposures. If Dr. Tomkinson had left his cases to the X-rays alone, could he have produced the results he had described? In any case, without cauterization what would the results have been?

Dr. J. GOODWIN TOMKINSON, in reply to the points raised in the course of the discussion, and more particularly to Dr. Arthur's remarks about Glasgow, said that he must not sail under any false colours. Although he occupied the position of assistant medical electrician at the Glasgow Western Infirmary, he simply engaged in cutaneous work. With regard to the question of pathology, his object in using the combined method of treatment for lupus vulgaris was solely to diminish the length of time spent in treatment. He had seen

many patients coming up repeatedly and having the Finsen treatment—the lamps they used were the Finsen-Reyn and the modified French model, the Lortet-Genoud—but making little or no progress. He therefore adopted a mixed method of X-rays and cauterizations, &c., with a view to diminishing the length of treatment. Without being prejudiced in his own favour he thought he could say that the results had been eminently satisfactory. In every instance there had been palliation, and in some instances such great improvement that he was vain enough to hope that eventually there would be a cure. He followed the other speakers with regard to the action of X-rays and caustics, but on the matter of producing good cosmetic results by means of the X-rays pushed to an extreme he took a different view. He had been at an institution that day and had seen a case of lupus vulgaris that had been treated solely by the X-rays. Six months ago the scar had considerable æsthetic value, to-day it was simply a disfigurement. Now he could say that, except for an occasional isolated telangiectatic dilatation or pigmented spot in one or two cases, he had had good cosmetic results in every instance, and as things now stood he had not a single scar that could be denominated as ugly. Some still retained tuberculous nodules, but these would again be treated, and in some instances he was hopeful of obtaining a permanent cure. One could not be too guarded, however, in speaking of tuberculous lesions, and he would not be at all surprised to see even in his best scars tuberculous nodules eventually manifest themselves. But the results, so far as one could judge at present, were highly satisfactory. Dr. Ross had criticised two of the cases of which he had shown photographs. In the case of the policeman, who was formerly in the Army, and who might have been judged syphilitic, the patient had responded to tuberculin. For this he had the testimony of the house surgeon who brought him the case. That in itself, he thought, was a sufficient proof that the lesion was a tuberculous one, although the character of the lesion had suggested the possibility of tertiary syphilis. Careful examination, however, confirmed by previous tuberculin treatment, indubitably pointed to its tuberculous nature. With respect to the girl, obviously the face was that of a congenital syphilitic. The depressed bridge of the nose and the linear scarring about the mouth pointed to a syphilitic basis. Nevertheless, the lesion was conclusively a tuberculous one. The case was sent to the Western Infirmary by a physician from one of the Glasgow hospitals as lupus vulgaris and he confirmed his diagnosis. He wished to join issue with Dr. Ross in regard to some of these (Dr. Ross's own) cases. Dr. Ross had remarked that in one of his cases while there was no response on the part of the lesions to syphilitic treatment, there was a marked response to X-rays. He (Dr. Tomkinson) was inclined to think that the response to the X-rays pointed to the lesion being of a tuberculous nature. If a syphilitic lesion, he felt sure that a course of syphilitic treatment would have cleared it up. Thorough—that is properly administered—antisyphilitic treatment would be sufficient. If syphilitic treatment was pushed far enough even those terrible cases which the French called *syphilis maligne* responded to a greater or lesser degree. In reply to Dr. Bruce, he had not attempted in many cases the form of treatment which

consisted of short exposures of X-rays without cauterization followed by a period of rest. He had seen lupus vulgaris of the ulcerative type improve very rapidly under the X-ray treatment alone; other cases were very obstinate. His theory with regard to non-ulcerative lupus (and rebellious cases were of that type) and the X-rays—and at this period in the history of radiotherapy he had no definite opinion about the action of X-rays, consequently he used them very carefully—was that lupus vulgaris of non-ulcerative type left the epithelium relatively uninvolved and manifested itself in the corium. The epithelium probably interfered with the penetration of the rays from a *therapeutic* point of view, and afforded a certain amount of resistance to them. Therefore he used this mixed method, which caused the breaking down of the epithelium and destruction of much tuberculous tissue, and allowed the rays to have free penetration to the corium, and he ventured to think—indeed, experience had proved—that his results were very much better than those which would be obtained by the use of the X-rays alone. That, however, was a matter rather for the medical electrician pure and simple to pronounce upon than himself. His work had been necessarily somewhat empirical, as it would be until he had formed a definite opinion as to the exact nature of the action of the X-rays, but nevertheless it had been productive of very good results.

The Electrolytic Method of Measuring X-rays.

By HOWARD PIRIE, M.D.

IN the production of X-rays in a Crookes' tube the law of conservation of energy goes on in the same way as in an incandescent lamp. In each case so much electric energy is supplied and so much work is done. In the case of the incandescent lamp, the energy is transformed principally into heat and light. By increasing the energy supplied to the lamp, more heat and light are given out. There is, however, a change in the wave length of the light given out—a small supply of energy giving a yellow light and a large supply a white light.

The analogy of the incandescent lamp can be applied to the X-ray tube. When electrical energy is supplied to an X-ray tube, it is transformed into kathode rays, heat, vibration, phosphorescence, light, and, secondarily, X-rays.

The main part of the electrical energy, however, is transformed into heat and kathode rays.

According to the efficiency of the X-ray tube, the proportion of X-rays to heat varies just as in an incandescent lamp the proportion of heat to light varies.

In an Osram lamp the proportion of light to heat is greater than in an old carbon filament lamp; so in a good water-cooled X-ray tube the proportion of X-rays to heat is greater than in a badly made light anode X-ray tube.

But no matter what the tube is, it remains as a transformer of energy, and follows the law of the conservation of energy. This is the principle on which I have founded the electrolytic method of measuring X-rays, and it may be stated thus: "The output of X-rays from an X-ray tube varies according to the watts supplied to the tube."

Thus I imagine a tube supplied by a current of 20,000 volts and 1 ma. gives out the same amount of X-rays as measured by a Sabouraud's pastille as the same tube supplied by a current of 40,000 volts and $\frac{1}{2}$ ma. Kelvin's electrostatic voltmeter could be used to tell the exact voltage, but for practical purposes the equivalent spark gap is used, and for the same coil probably varies directly as the voltage.

To measure the quantity of current that flows through the X-ray tube I have devised this meter. It is a capillary tube with 100 divisions. Each division is 1—200 c.c. One end of the capillary tube is open and the other terminates in a dilatation. Through the walls of the dilatation penetrate two platinum wires. The dilatation is filled with tap water, and a drop (called the indicator drop) is left in the capillary tube. This meter is put in series with the X-ray tube, and as the current flows through the meter it decomposes the water into oxygen and hydrogen. These gases collect in the bulb and make the indicator drop rise. The number of divisions registered is a measure of the quantity of electricity that has flowed through the X-ray tube. If a constant current of 1 ma. is made to flow through this meter for ten minutes, it liberates 22 divisions of gas at 60° F. (while at 70° F. 22.4 divisions are liberated). Practically the same result is got when the meter is used in series with an X-ray tube. The difficulty is to keep the milliamperemeter constant at 1 ma.

Now if the equivalent spark gap remains constant at, say, 6 in., while the meter registers 22 divisions, we have two figures which, when multiplied together, are a measure of the electrical energy supplied to the X-ray tube, for the equivalent spark gap represents volts and the divisions of the meter represent milliamperes and time.

As the voltage and milliamperage vary, so the output of X-rays varies. For example, in the three following experiments the same tube was used with the following results: When the equivalent spark gap was 6 in. and 10 divisions were registered on the meter, then (10 by 6

equals 60) the B tint was shown by Sabouraud's pastille. When the equivalent spark gap was $4\frac{1}{2}$ in. and 13 divisions were registered, the pastille turned to the B tint ($4\frac{1}{2}$ by 13 equals $58\frac{1}{2}$). When the equivalent spark gap was $2\frac{1}{2}$ in., 24 divisions were required to turn the pastille to the B tint.

E. S. G.	Divisions on Meter			Constant	Sabouraud's disc	
6	...	10	...	60	...	B tint
$4\frac{1}{2}$...	13	...	$58\frac{1}{2}$	..	B "
$2\frac{1}{2}$...	24	...	60	...	B "

In each case the same quantity of electrical energy was supplied to the tube and the same quantity of X-rays emitted as measured by Sabouraud's pastille. The judgment of the colour was usually done by my wife, who gave her opinion without bias as she was not interested in the experiment. The difficulty of getting a tube to remain constant at one equivalent spark gap is overcome by taking the spark gap for every division of the meter and adding up the sum, thus:—

E. S. G. $10\frac{1}{2}$	...	...	Meter 1 division equals $10\frac{1}{2}$			
E. S. G. $10\frac{1}{2}$	...	...	..	1	..	$10\frac{1}{2}$
E. S. G. 10	...	...	..	1	..	10
E. S. G. $9\frac{1}{2}$	...	...	..	1	..	$9\frac{1}{2}$
E. S. G. $9\frac{1}{2}$	...	...	..	1	..	$9\frac{1}{2}$
Total						50

X-ray tubes vary in their efficiency, and for this electrolytic method they must be standardized. For this purpose place a Sabouraud's pastille 2 cm. from the wall of the tube, mounted on metal and shaded from light. Let the X-rays fall on the pastille and at the same time note the equivalent spark gap in inches and the number of divisions registered by the meter. Suppose the pastille turns to the B tint when 15 divisions have collected, and the equivalent spark gap is 4; then multiply 15 by 4, and you get 60 as the constant for the tube. I have found for several tubes that the square of the distance in centimeters from the source of the rays to the pastille is the constant for the tube.

Thus a tube of 6 cm. radius has in general a constant of 8 by 8 equals 64; but this is only approximate, and each tube must be standardized against a pastille or other standard of measurement. I have found this true for a water-cooled tube, a Bauer tube and a light anode Müller tube. In using the meter care must be taken that the reverse current is suppressed, that there is no leak to earth, and that no current is allowed to pass through the meter which does not also produce X-rays.

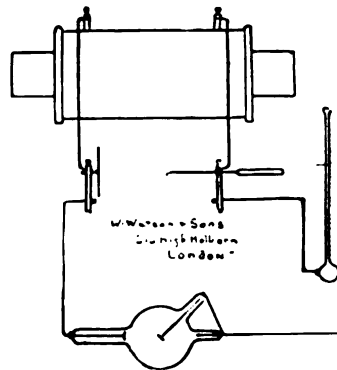
For instance, there must be no sparking of the softening apparatus in a Müller tube. To reach its present form this meter has gone through several changes. My first difficulty was that the bulb was made too small, and a heating effect was produced by the passage of the current through the water. This is avoided by making the bulb larger and adding a little salt to the water. The next difficulty was with the platinum electrodes in the bulb. When they were brought close together in order to reduce the resistance and consequent heating of the water, I found that instead of flowing through the water and causing electrolysis, the electricity preferred to jump from one electrode to the other in the form of a spark.¹ In fact, the meter once exploded from a spark, thus passing and igniting the mixed gases. I therefore increased the size of the electrodes and brought them close together. With a meter made thus I found that, after stopping an X-ray experiment, the meter kept on registering for the next few hours, and I concluded that the platinum of the negative electrode was giving up the hydrogen it had absorbed while the current was passing.

In order to set the indicator drop at zero, I expanded the free end of the capillary tube so that when the drop reached the free end it was expanded into a bubble, which, on bursting, ran down the sides of the tube and was caught at a constriction at the zero point. This has also been abandoned, as a fresh drop can always be put in position by giving the meter a gentle shake. A lady's hat pin can be passed down the tube to alter the position of a drop. A small piece of cotton wool should be kept in the cup at the top of the meter. The meter is filled in the first instance by means of a capillary pipette, made by drawing out a piece of glass tubing after heating it in a Bunsen. To anyone using this meter for the first time I would advise the following: Use a tube that remains constant with an equivalent spark gap of 4 in. to 5 in. An Osmo regulating tube is preferable, as there is no necessity to disconnect the meter while softening the tube. The meter *must* be disconnected when softening a Müller tube. Several experiments should be made with a Sabouraud pastille in order to standardize the tube. When a spark passes about every ten minutes across the equivalent spark gap, one should consider that the true equivalent spark gap is being measured. Do not attempt to use the meter with a tube which varies its equivalent spark gap quickly. Read the meter directly the experiment is finished,

¹ With an equivalent spark gap of 10 in., and using London tap water, I found the current preferred to go round the outside of the bulb of the meter in the form of a spark rather than through the water. The addition of a little salt to the water at once stopped this.

as the hydrogen and oxygen will slowly diffuse through the indicator drop and so alter its position. The indicator drop usually falls one or two degrees after a few hours.

I have used this meter now for a year and shall show you some of the results of treatment by means of it. For practical use I have found I can quickly train a nurse to read the meter, measure the spark gap, and multiply the two numbers together. She uses a Butcher's shield and a tube which I have standardised, and I tell her to give the patient so many units.



Arrangement of Apparatus for using Dr. Pirie's meter for measuring X-rays.

ESTIMATION OF REVERSE CURRENT.

I estimated the reverse current passing through an X-ray tube by means of electrolysis as follows:—

I arranged an apparatus as follows: I cut the positive wire between the coil and the X-ray tube. I connected the broken ends to platinum wires, and passed these platinum wires into a glass vessel containing tap water. Over each platinum terminal in the water I placed a eudiometer (which I show you) filled with water, so that when the current flowed through the water each eudiometer collected all the gas given off at that terminal. The eudiometers were divided into 1—100 c.c. divisions. When the apparatus was thus prepared I passed a current through the X-ray tube. As soon as the current flowed, bubbles of gas came off from the platinum terminals. These bubbles collected at the top of the eudiometer tubes. After collecting a quantity of gas in each eudiometer tube

I noted the quantity. Theoretically one eudiometer should have collected twice the amount of gas the other had. Practically it was never so. There were two reasons for this:—

(1) Oxygen is more soluble in water than hydrogen is.

(2) Each eudiometer contained a mixture of oxygen and hydrogen, due to the passage of reverse current. However, one eudiometer always contained much more gas than the other, and I took the one with the greater quantity of gas as if it was pure hydrogen and mixed it with more than half its volume of oxygen. I then exploded the mixture by means of a spark from the coil passing between two platinum wires sealed into the top of the eudiometer. I allowed water to take the place of the exploded gas and noted the volume of gas left, from which the percentage of reverse current can be calculated. These are the figures of such an experiment. Using a very soft tube, with equivalent spark gap of 3 cm., I collected 23·3 divisions of gas supposed to be hydrogen; with this I mixed pure oxygen, making a total volume of 41 divisions of mixed gas. I then exploded the mixture and a volume of 9 divisions remained. Therefore (41 – 9) 32 divisions of oxygen and hydrogen had combined, leaving 9 divisions of oxygen unexploded. There had therefore been 10·6 divisions of oxygen and 21·3 of hydrogen previously present. But I had collected in the first instance 23·3 divisions of gas supposed to be hydrogen, and I found by explosion there had only been actually present 21·3 divisions of hydrogen. Therefore the difference of 1·96 must have been oxygen. But oxygen takes twice as long as hydrogen to collect, and therefore 3·93 divisions of hydrogen would have collected in the time that 1·96 divisions of oxygen collected; and had there been no reverse current I would have collected 25·23 divisions of hydrogen instead of 23·3.

Let 100 = total time current flowed.

„ x = time of direct current.

$$\text{Then } \frac{x}{100} = \frac{21\cdot3}{21\cdot3 + 1\cdot96 \times 2} = \frac{21\cdot3}{25\cdot26} = 84\cdot4$$

i.e., 84·4 per cent. of the current was direct and therefore 15·6 per cent. was inverse.

I then turned to the other eudiometer and treated it in the same way, and found 16·2 per cent. of reverse current had passed. This error of 0·7 per cent. with such small quantities used is, I think, excusable. I expected to find a large reverse current in this experiment, as I was using a very soft tube and no valve tube. On using a valve tube I found no

reverse current was passing when using this electrolytic method. An actual experiment with a valve tube was as follows: I collected 42·2 divisions supposed to be hydrogen, and mixed this with 54·8 divisions of pure oxygen. Total, 97. I then exploded the mixture and found 33·2 divisions remained; therefore $(97 - 33·2)$ 63·8 divisions of gas had united to form water, of which 21·26 was oxygen and 42·53 hydrogen. But I started with 42·2 divisions supposed to be hydrogen. There had been no reverse current, and my error of 0·3 accounts for the difference. Other experiments are reported in the tables.

TO SHOW THE VALUE OF A VALVE TUBE AS A RECTIFIER.

Gas collected, supposed to be hydrogen	Pure oxygen added	Total of mixed gas		Gas left after explosion	Actual amount of hydrogen present previous to explosion	Per cent. of inverse current
(A) 42·2	54·8	97·0	Explosion	33·2	42·52	Nil
(B) 23·3	16·7	41·0		9·0	21·2	16·2
(C) 21·3	15·9	37·2		7·2	19·86	11·5

TO SHOW THE VALUE OF A VALVE TUBE AS A RECTIFIER.

Gas collected, supposed to be oxygen	Pure hydrogen added	Total of mixed gas		Gas left after explosion	Actual amount of oxygen present previous to explosion	Per cent. of inverse current
(A) 8·7	21·5	30·2	Explosion	4·2	8·6	Nil
(B) 10·5	22·5	33·0		11·5	7·16	15·9
(C) 9·8	27·2	37·0		11·7	8·43	7·5

In the first experiment (A) (A) a valve tube was used, and the equivalent spark gap was 3 in. to 4 in. In the second experiment (B) (B) no valve tube was used, and the equivalent spark gap was $1\frac{1}{4}$ in. In the third experiment (C) (C) no valve tube was used, and the equivalent spark gap was 3 in. to 4 in. There is an experimental error of not more than 4 per cent. in this last experiment.

DISCUSSION.

The PRESIDENT (Mr. Deane Butcher) remarked that Dr. Pirie had shown once more that the quantity of the X-rays proceeding from a focus tube was a function of two things—the voltage and the milliamperage. His method was exceedingly useful for measuring a fractional dose. There was at present no means of measuring satisfactorily a fractional part of Sabouraud and Noiré's dose save by Dr. Pirie's instrument.

Dr. N. S. FINZI said that he had worked with one of the older forms of Dr. Pirie's instrument, one in which the platinum wires came very close together. When he held the bulb in his hand for thirty seconds the indicator immediately rose about two or three degrees. That was a fallacy which could be overcome by using as small a bubble of air as possible by filling the bulb with water almost up to the point where the readings started. He found the instrument very useful indeed, given an X-ray tube that kept its vacuum fairly constant. It was then easy to gauge the number of divisions necessary to produce the requisite dose. But when the worker had an X-ray tube that varied its vacuum, as a great many X-ray tubes did, he would find that a comparatively small difference of 1 in. or 2 in. in the alternate spark gap made a very great difference in the reading of the instrument. With tubes giving from 4 in. to 6 in. alternate spark gap the readings were fairly constant, but above 6 in. their constancy could not be relied upon. He agreed with the President as to the extreme value of the instrument for partial exposures.

Dr. REGINALD MORTON asked Dr. Pirie whether his meter was an index of the value of an X-ray tube for radiographic purposes. Dr. Pirie had provided a good opportunity for raising the question as to the relative condition of tubes. He (Dr. Morton) had never been satisfied that there was any real difference within certain limits between the tube used for radiographic purposes and the tube used for treatment. He took it that for any given expenditure of energy in an X-ray tube the tubes that were moderately alike gave approximately the same therapeutic results. He had two tubes, not indeed by the same maker, but their resistance as judged by the alternate spark gap was in each case about $4\frac{1}{2}$ in. One was a Chabaud and the other was a Müller. There was not a very large difference in the size of the tubes, but with identically the same current they gave quite a different screen. With the Chabaud it was possible to obtain a perfect radiogram of the kidney showing all the transverse process. In some cases the outline of the kidney could be seen quite unmistakably when the plate came fresh out of the fixing bath. But with the Müller tube, using the same diaphragm and the same distance from the anti-kathode, no decent radiograph could be obtained at all. Did Dr. Pirie consider that an X-ray tube working under a certain constant ought to be of equal value for radiographic and therapeutic purposes? Why was it that he obtained these divergent results from the same tube or from different tubes working under precisely the same conditions?

Dr. W. IRONSIDE BRUCE said that he considered Dr. Pirie's method of measuring the X-rays an excellent one, and would take the first opportunity of putting it to the test. He suggested that the difficulty of absorption of gas by the electrodes to which allusion had been made might to some extent be obviated by collecting gas for measurement purposes from one electrode only, namely, the one at which least absorption takes place. The gas from the other electrode might be allowed to escape, and thus the danger of explosions would also be removed. The trouble in getting a tube with a mica regulator to work with Dr. Pirie's meter might be solved by bringing it close up to the kathode of the tube. The instrument was an exceedingly clever one, and was likely to prove useful in the hands of X-ray workers.

Dr. A. H. PIRIE, in reply, admitted that there was at present no exact way of measuring the X-rays; his instrument was made simply to serve for practical purposes. He found it difficult in some cases to register tubes which were above 6 in. spark gap. Other tubes would be quite constant with a spark gap of 10½ in. In answer to Dr. Morton, he said that 10 X on the Kienboch apparatus equalled Sabouraud and Noiré's B tint. If he produced the B tint in 50 units of his own measurement, the Kienboch measurement of 10 X would at the same time be produced. He expected that in order to produce a photographic result equal to 10 X with Kienboch the Chabaud would show about 50 units of measurement and the Müller about 120. One tube was not such a good transformer as the other, just in the same way as some coils were less efficient than other patterns. There was a limit to the output of rays irrespective of the character of the tube on the same principle as, no matter how much petrol was supplied to a motor car, it could not exceed a certain speed. The difficulty respecting absorption had been overcome by making the platinum point a tiny one, but he thought that it would be very difficult to put the meter so close up to the X-ray tube as had been suggested. He added his thanks to Messrs. Watson and Son for providing the apparatus.

Electro-Therapeutical Section.

April 24, 1908.

MR. W. DEANE BUTCHER, President of the Section, in the Chair.

The Electrical Treatment of Atonic Conditions of the Digestive System.

By REGINALD MORTON, M.D.

THE frequency with which atonic disorders of the digestive system are met with in medical practice makes the question of their treatment one of almost universal interest. Like all other fairly common disorders, the list of suggested remedies is large, and each one has its trusted advocates. It is not the purpose of this paper to discuss treatment by drugs and diet, and their respective merits; these are more or less generally known and need not detain us, except to point out that the question of diet is all-important in every case and to remind you that in the majority of cases the action of electricity is not so rapid that you can afford to discontinue drugs, *e.g.*, laxatives, entirely and at once. Cases of atonic dyspepsia or constipation due to atony of the colon have always been under a more or less prolonged course of treatment, and, whatever electrical method is employed, I always insist on the laxatives, &c., being continued as before. They are to be reduced in amount gradually as improvement sets in. For convenience I divide cases of atonic dyspepsia and constipation into two main classes:—

- (1) Due to defective innervation—neurosis.
- (2) True atony of the muscular coat of the digestive canal.

In the first class the muscular coat is, presumably, not at fault, and it is to the nervous system that we must direct our energies. For this purpose almost any form of electricity may be tried, and with equally successful results, preference being given, in my opinion, to the

more stimulating forms, such as the induction coil currents and the sinusoidal current from the main, or from a machine made for this purpose where the alternating current is not available. In many of these cases the moral effect is one of some importance, and for this reason good results are sometimes obtained from static electricity or high frequency currents, which may be more or less locally applied.

The constant current alone I do not consider to be of much good, but in conjunction with the coil—the de Watteville current, as it is sometimes called—it seems to be a very useful method, and one that has achieved good results in the hands of some workers (Mangelsdorf, *Archives of Röntgen Ray*, April, 1907).

Mangelsdorf also claims to have obtained good results in the more severe cases of true atony of the muscular coat, but my experience does not bear this out. Provided one can remove any mental or psychological element that may be present in cases of this class the treatment becomes a comparatively simple matter, and one or other of the electrical methods mentioned will nearly always bring about a cure.

When we come to deal with cases of the second class we are brought up against an entirely different problem, and one that will tax our resources to the utmost—as, indeed, it probably has that of the medical man who refers the case to us. Here we have to deal with an organ whose muscular coat has undergone atonic changes, perhaps to an extent almost amounting to degeneration. Regulation of diet has little effect, and drugs afford but temporary relief. Massage will have been tried with but slight success for reasons which are more or less obvious.

At the same time I do not mean to say that these methods are by any means useless, but rather that we should use electricity as an additional agent in many cases and, as I have already said, only reduce the amount of drugs as the case shows signs of undoubted improvement.

In my opinion the person who sets out to treat a severe case of this kind with electricity only will most likely be disappointed, chiefly on account of the slowness with which the improvement is brought about. From the very nature of the disease, it is unreasonable to expect that any remedy can bring about a rapid cure.

Having a case of this kind to treat, the question arises: What are we going to do for it in the way of electrical applications? Every form of this agent has been tried at one time or another, and so long as this was confined to the more ordinary forms, such as constant and faradic currents, no very great success was attained—so little, indeed, that until quite recently most writers on gastro-intestinal disorders

have ignored electricity when discussing modes of treatment. That this should be so is not surprising. It is difficult to see how the use of the constant current could do very much; it is insufficiently stimulating, and its application in sufficiently large currents to materially influence the muscular coat of the digestive organs is attended by the risk of severe burns, due to the deposition of electrolytic products in the skin.

Then take the induction coil currents—primary or secondary—as ordinarily used; I consider the rate of interruption much too fast to benefit the muscular tissue directly.

In the case of degeneration in a voluntary muscle, as is well known, no reaction takes place when an ordinary faradic current is applied unless the interrupter is set to work very slowly; the muscle can also be made to contract rhythmically to the constant current if it be made and broken equally slowly. The greater the degree of degeneration the less frequent must be the interruptions if the muscle is to respond to each.

In unstriped muscle we have normally, to electrical impulses, a prolonged latent period and a prolonged period of contraction. In a state of atony these are increased and the condition, in my opinion, comes to resemble somewhat that of a voluntary muscle in a state of degeneration. Hence I consider ordinary faradic current to be unsuitable both from the rapidity of its interruptions and the small density of current that could be obtained, or used if obtainable. We must not forget that we can reach the intestinal muscle only through the more superficial voluntary muscles of the abdominal walls, which are necessarily thrown into contraction, and this latter becomes unbearable to the patient if the current density is at all high. The same objections apply to the sinusoidal current at the frequencies ordinarily supplied, from 40 to 100 cycles per second. While it is possible to set the interrupter of an induction coil to work very slowly, even then only a comparatively small current density can be employed owing to the painful nature of the contractions produced when this is large. This is, of course, mainly due to the inherent qualities of the current itself, notably to the very sudden rise of potential at each break of the primary circuit.

From what has been said it will be seen that what we require is a current of large magnitude, in view of the large mass of the abdominal contents to be treated, and one that will vary this magnitude sufficiently rapidly to cause the muscular coat of the intestine to contract and yet slowly enough to allow a contraction to be completed and relaxed before another is induced. It must also be practically free from the deposition of electrolytic products in the skin to any possibly harmful degree.

These conditions are met very completely by a sinusoidal current of very low frequency.

In a paper on this subject which it was my privilege to read before the Electro-Therapeutical Section of the annual meeting of the British Medical Association at Exeter last July, I then referred to what I called, for the want of a better term, the "periodic time" of a muscle, and by this I mean the length of time taken by any given muscle in passing through the various phases which follow the application of an electrical impulse. These phases are: (a) the latent period; (b) the period of contraction; (c) the period of relaxation; the sum of the three constituting what I have termed the "periodic time" of the muscle. I feel sure that this is a matter that will become increasingly important in the future, both as regards diagnosis and treatment. Its practical application here lies in the fact that it gives us a clue as to the proper frequency to be employed in any given case. The time interval between the cycles of the current should not exceed the "periodic time" of the muscle. While it is not possible to determine the "periodic time" of the muscular coat of our patient's intestine by actual experiment it is found, as a matter of practical experience with degeneration in a superficial voluntary muscle, that it is only in the more severe cases that the muscle makes no attempt to keep time with a current having a frequency of one cycle per second, and this frequency, I may say, is very suitable for the great majority of cases. I have been frequently asked if a three-phase current is necessary or has any advantages over a single-phase current. So long as the frequency is sufficiently low it matters little which is used.

The method of application is practically the same for all cases. I use three electrodes: one on each side of the lumbar spine and the third on the anterior abdominal wall if the epigastrium of the stomach is the part chiefly at fault, or over the course of the colon if the case is one of constipation, commencing at the cæcum and working gradually around in the direction of the hands of a clock. If the rectum is at fault a rectal electrode must be used, but not a bare metal one—it must be covered with membrane and water-jacketed, so to speak. A certain amount of electrolytic products are set free owing to the rapid diffusion of the current, and these become objectionable when bare metal is placed in contact with living tissues. If a single-phase current is being used the two posterior electrodes are joined to the same terminal. With a three-phase current the three electrodes are attached one to each of the three terminals of the apparatus. The duration of the applications is at first

from ten to fifteen minutes, and the current strength just enough to cause gentle contraction of the abdominal muscles.

The length of the application and the strength of the current are both increased on subsequent occasions, so that by the fourth or fifth the duration is thirty minutes and the current strength sufficient to cause strong contractions of the muscles of the anterior abdominal wall. This must be continued three times a week for a month or six weeks, or more.

I will not take up your time by relating the details of the several cases I have treated. There is a great sameness among them all, and I can only say that in all those where the treatment has been regularly attended to for a sufficient time great improvement has taken place in the general health and in the local condition, so much so that the patients have in most cases voluntarily assured me that it had been well worth the time and trouble entailed.

The great difficulty is to get the patients to come regularly for a sufficiently long time. Very often they are only too ready to throw it up for some trivial excuse. This and the length of time required are the chief drawbacks to the method. But as regards time I ask: What other method gives better results?

Before closing I should like to say something about the best means of generating the current I am advocating. Personally I use a large motor dynamo which has collecting rings connected to the commutator on the motor side and allows one to take off a three-phase alternating current, and the armature is made to revolve slowly by means of a resistance in series, the field magnets being maintained at full magnetism.

A large machine is preferable to a small one, however the latter may be arranged. The larger one is not so easily disturbed by small fluctuations in the current supplied to, or taken from, its armature, while its weight, bearings and friction of brushes provide a light but steady mechanical load, which is a great advantage.

Machines of small size, and made to run slowly by means of a friction brake, have been in use but have not proved satisfactory in practice owing to their tendency to rotate unevenly. Mr. Schall has got out a motor of comparatively small size, arranged with collecting rings, and supplying the primaries of three sledge coils. The patient is put in circuit with the secondaries of these sledge coils.

With my large machine I use the same method of regulation, as it seems to be the best; the regulation is very fine and the patient is effectually cut off from the main current, so that there is no danger of his getting shocks through touching anything connected to earth.

While this paper has for its main object the treatment of atonic conditions of the digestive system I would like to point out, before I finish, that this slow sinusoidal current will be found invaluable in the treatment of every condition where atony or degeneration of muscular tissue is the chief factor. Furthermore, having at hand an alternating or pulsating current of a frequency which is variable from one cycle in two seconds to, say, ten per second, and a means of ascertaining the frequency at any given moment, I foresee a method of expressing the degrees of degeneration in muscular tissue in a numerical form, and, according to the highest number of impulses per second or per minute to which the muscle will rhythmically respond, we shall be able to obtain a better idea of the degree of degeneration existing in different cases and of the progress of any given case. I hope to have something to say on this point at a future date.

DISCUSSION.

The PRESIDENT (Mr. Deane Butcher) expressed the thanks of the Section for Dr. Morton's interesting communication, which had been prepared at some disadvantage and at short notice. The modes of electrical treatment he regarded as threefold: first the gymnastic exercise of the abdominal muscles, next a sort of electrical massage, thirdly, galvanization, which was an important means of influencing the nutrition of the digestive organs. He had seen cases in which galvanization alone had been of great assistance. The de Watteville currents were occasionally of much benefit, and appeared to act on the nervous rather than on the muscular mechanism. The galvanic current was indicated in disorders of digestion, the de Watteville current for nervous disorders, such as palpitation of the heart, and the triphasic current or some form of slow intermittency for the necessary massage and exercise of the muscles of the abdominal wall, which were generally in a very relaxed condition. Another point was the production of local hyperæmia, which was of great importance in such cases. It was probable that the constant current might act in this way, like a hot fomentation or mustard plaster. He had been pleased to hear Dr. Morton allude to the question of the periodic time, as it was one which would well repay study. Leduc had shown that the production of electrical sleep was due to the synchronizing of the electric oscillation with the natural periodic time of the animal's nervous system. The stimulation, the soothing, or the inhibition of the neurons depended on the periodicity of the electrical stimulus.

Dr. LEWIS JONES said it appeared probable that the simple galvanic and faradic currents were likely to be displaced in treatment by the use of rhythmic currents of one kind or another. He appreciated Dr. Morton's paper as a step in the right direction. No doubt there were several forms of current which might be employed in the treatment of conditions for which simple galvanization or faradization were more or less unsatisfactory. There were the long waves of simple sinusoidal type, which Dr. Morton had particularly dealt with in his paper, and which appeared specially useful for stimulating such structures as unstriated muscles or striated muscle in a state of degeneration. Another form of rhythmic current treatment was to use, not single waves, but groups of short waves, commencing with very small impulses, growing into large ones, and then dying away again, followed by a period of rest, and then to repeat the cycle. That form of current was rather more easy to produce if one had at hand the ordinary sinusoidal current of the alternating current electric lighting mains, or it could be obtained from a small motor generator. An apparatus was in use at St. Bartholomew's Hospital which some of the members present might have seen, namely, a mechanical motor-driven device in which a secondary coil was caused to move to and fro over a primary, which was supplied by current from an alternating source. Another device which he had had in use for a long time consisted of a little clockwork arrangement, which was used as follows: The clockwork moved an arm up and down, and that arm carried a wire, which dipped into a beaker of water, at the bottom of which a metal plate was fitted. In order to produce a better graduation of current between the zero and the maximum, it was found very convenient to have an inverted glass funnel standing in the water. Under those conditions the wire, in its excursion downwards, not only approached the other plate so as to reduce the length of the electrolyte through which the current had to flow, but also passed from a narrow channel of electrolyte in the narrow neck of the funnel into a progressively larger area as it descended, so that the variation in the resistance of the electrolytic part of the circuit was considerably greater than would have been the case without the funnel. That was an apparatus which could easily be made with the aid of a piece of cheap clockwork, and the results to be obtained by it were quite satisfactory. The whole subject of interrupted currents was in need of re-examination from beginning to end. He was sure that the interrupted currents generally used had too high a periodicity, mainly, he thought, because the induction coil was the usual source, and it was an apparatus which generally gave currents of rapid frequency. But for almost all treatment he was sure that waves of current which were shorter than those of the induction coil would be better.

Dr. BUCKLEY (Buxton) said he had been very much interested in the treatment of atonic conditions of the gastro-intestinal system for many years, but, as he practised in a health resort, the number of patients who had come his way, and were willing to spend any length of time on the treatment, had been small, and it was out of the question for him to obtain such apparatus as had been described. Galvanism, as the President had mentioned, was

perhaps not to be entirely overshadowed by sinusoidal currents. But the kind of galvanization which he (Dr. Buckley) had used had been the galvanic current interrupted by hand, at a frequency averaging from 10 to 20 per minute, and he believed he had obtained good results, though it was always possible to deceive one's self. A large number of his cases were those in which neurosis was a well-marked feature, but in many there seemed to be genuine muscular atony also; indeed, many cases of muscular atony, he believed, started as neurosis. There was a broad group of cases of dilated colon, perhaps dilated rectum, generally constipation, or marked mucous colitis, to which he had been applying the constant current by inserting a douche electrode into the rectum. From the difficulty he had in obtaining such an electrode, he assumed that the method was not common. It was a gum-elastic vaginal douche pipe, in the interior of which ran a coiled wire, the pipe being perforated at various parts to allow of the escape of the electricity. A pint or more of normal saline solution was put into the rectum, and, the douche being cut off, the current was turned on. In that way there was a large water electrode in the rectum, and higher currents could be used than without it, for though he had seen ulcers produced on the abdominal wall they never occurred in the rectum. In a large majority of the cases much improvement resulted from this method of galvanization. He was led to adopt the method because he was sceptical of being able to get sufficient current through the abdominal muscles by ordinary methods. He mentioned the matter so that he might hear Dr. Morton's criticisms on it for his own guidance.

Dr. DAVID ARTHUR said that for many years he had treated chronic constipation and atony of the digestive tract by interrupted galvanism—sometimes interrupted by the hand and sometimes by an instrument such as Dr. Lewis Jones described some time ago. Breaking by the hand, with an electrode such as Dr. Buckley used, did tolerably well. Dr. Morton had dealt so fully with the treatment that in order to extend the discussion it would be necessary to embark on pathology. The atony caused by chronic constipation did very well when treated electrically. He had examined large numbers of school children, and found that the digestive troubles often started in quite early life. During playtime it was not uncommon for bigger children to pull smaller ones off the convenience and sit there themselves a long time reading, so that many children returned into school without having been able to obey the calls of Nature, and this, he believed, caused the commencement of digestive trouble. Similar conditions often obtained in millinery and other establishments, where work was carried on under such strict supervision and at such a rush that the calls of Nature were largely neglected. For the conditions under discussion he had not used faradism much, it was generally galvanism.

Mr. BOKENHAM said that with regard to the treatment of atonic conditions, especially constipation due to atony of the colon, he had long held the view, just expressed by Dr. Arthur, that the condition in many instances arose in early life, and that if proper habits of regularity were more generally insisted upon in the nursery, there would be far fewer sufferers from chronic

constipation in later life. When consulted by a patient suffering from atonic constipation, he first made careful inquiry as to the periodicity of the natural motions, and then went on to ascertain the condition of the colon and the rectum. The colon would generally be found full, and the motions scybalous, clayey, and difficult to eject. If there was a large, dilated, atonic colon, with a big pouchy rectum, more or less full of fæcal material, and therefore with its irritability blunted, he did not think that any electrical measures, however energetic, would do much good if applied straight away. One should first secure complete irrigation of the intestine and empty it, for which he found large injections of olive oil most useful, half a pint to a pint at the body temperature being slowly injected by means of a douche with a soft rubber tube long enough to reach well up towards the transverse colon, so as to secure the emulsification of the contents and their dislodgment from the intestinal pouches. When, in earlier days, he attempted electrical treatment without those preliminary measures, the results were neither so good nor so rapid as latterly, with a combination of both. With regard to the various forms of current, he would like to hear the author's opinion of "Morton wave" currents. With a static machine working well one had under control, better than with any other source, the character and frequency of the interruptions; a rapid or a slow wave could be produced at will. He had found that, within limits, the slower the wave the better for such atonic conditions, whether for atony of the gastro-intestinal tract or for conditions not strictly atonic, such as Bell's paralysis or the finer neuro-muscular lesions. He believed that the slowly interrupted or pulsatory currents, in whatever way generated, were likely to prove the electric agents of greatest value in therapeutics.

Dr. PIRIE said that Dr. Morton had commented on the impossibility of measuring the periodic time of unstriped muscle, and he asked Dr. Morton whether he had ever filled the stomach with bismuth, put a sinusoidal current through it, and watched it by means of X-rays with the screen, to see whether it contracted in any way. The same could be done with the rectum. There was a difficulty in regard to the de Watteville current, in that when applying both faradic and constant electricity at the same time, one source went through the circuit of the other. The resistance of the coil was less than the resistance of the body, and the constant current went through the coil instead of through the patient. He had found, under such circumstances, that he could get a current of 220 ma. through a patient, but when he took out the coil a much weaker current only could be tolerated.

Dr. G. B. BATTEN said Dr. Morton's paper was a very suggestive one. He had done very little practical work in that way, but he saw many cases of constipation due to atony of muscles. He asked whether the author considered that the large current with slow alternation from the positive to the negative phase was a more potent therapeutic agent than the constant current slowly interrupted, either by such an apparatus as exhibited or any other. He had used a clockwork arrangement which interrupted at the rate of about twice a second, with a needle dipping into an electrolyte—an inexpensive method. Or

was it better to have a current such as he described a few years ago made from a rectifier—a sinusoidal current, then interruption, and another phase of the same kind? The constant current interrupted would be very much like that if it dipped into a bad conductor; it would be only one-phase, and there would be electrolytic deposits. But if they were used through a fluid conductor, and, instead of putting electrodes on the back of the body and on the abdomen, they were used in baths, as on the Continent, the difficulty would be got over. He asked whether Dr. Morton had had experience of his apparatus, or similar ones, by baths. In private or hospital practice that method might be very inconvenient, but the conditions could be brought about easily in the patient's house. In regard to the remark that the conditions of constipation began early in life, that was not always so. He knew many families where all the children had the same nurse and were brought up in the same way, yet some had constipation and others were quite healthy. Many children seemed to have disorders of digestion from the first week of life. Later in life one came across terrible cases of constipation, in some of which Metchnikoff's suggested removal of the colon had been carried out, and he had treated such cases before, during, and after operation. Some of them had been cured, others had a return of the atony of the digestive tract, which remained as bad as ever. In one case a lady had suffered from chronic constipation for a very long time. At first the bowel was short-circuited, but her condition was still very bad. Douches were used, but regurgitation took place into the blind end, and he had spent many hours trying to empty the colon. Douches and the slowly interrupted constant current were continued for weeks, but eventually the whole colon had to be removed; nevertheless the small intestine was now affected with the same atony. He asked whether Dr. Morton had had experience of treatment of similar cases after operation. On the other hand he knew of cases in which brilliant results ensued from the operation, the condition having been proof against drugs and any other measures.

Dr. E. S. Worrall said that for a long time he had looked upon atony of the gastro-intestinal tract as a tiresome and troublesome condition, which gave very little result from the use of faradism or galvanism, and sometimes the combined current. But of late he had been much encouraged in using high frequency currents, and he had employed them in several ways. He believed the use of the glass electrode was of very little value. Many cases had given most satisfactory results when treated by a brush, the current being taken from a large resonator or bipolar coil. Some cases in middle-aged people, whose trouble dated back to school days, cleared up well under that treatment. The treatment was administered about three times a week, the patient being allowed to continue the use of aperients which he had been taking. Gradually he would find he could do with less and less aperients, and in a short time could dispense with them altogether. But the electrical treatment was continued for a little time after that stage was reached. During the last three years he had had many such cases, and had been able to ascertain in regard to some of them that the benefit had persisted.

Dr. MORTON, in reply, said that from the beginning of his career as a medical electrician he had been much impressed by the slow pulsating or alternating currents, and he confessed he had not given any great trial to other forms. Possibly that was partly due to prejudice and partly to lack of opportunity for carrying it out. The use of the galvanic current interrupted by hand seemed to him to be a sound method of treatment. He could not find any objection to it except that it was inconvenient, and that, whatever precautions were taken, there was always the consciousness that one might be producing some sort of burn, due to the deposition of electrolytic products. Even in the case of the water-jacketed electrode for use in the rectum, which was enclosed in a vaginal pipe, as mentioned by Dr. Buckley, the precaution was not too great, but where there was nothing but membrane, that membrane, when inflated with water, would not prevent the electrode getting near the mucous membrane and an ulcer might result. That was one reason which made him hesitate to use the galvanic current. Dr. Buckley's method was a modification of the system he used himself. He had nothing to say against massage, and if massage had been in use in a case, he never had it stopped, because the kind of case under discussion was one of the most difficult to cure, and he fully recognized that electricity would not do everything. He thought the current used by Dr. Lewis Jones, *i.e.*, the ordinary sinusoidal current, gradually increasing and decreasing in amplitude, was exceedingly useful for treating degenerated muscle. The only thing which bothered him about that current was that the waves were too fast, although the magnitude was continually altering. He felt that muscle in a state of degeneration could not respond to waves that were going at such frequency. With the large and slow waves time was given for a definite contraction and relaxation of the muscle, and thus there was true electrical exercise. To produce such waves by hand was tedious, and if a machine could be got to do the work it would be a very great saving, and attention could meanwhile be given to other matters. It was a great advantage to have an alternating current for another reason: not only did one reduce the risk of damage from electrolytic action, but a more stimulating action was obtained. A muscle was charged positively, and immediately a current was passed in the opposite direction. There was a more marked result by following a negative current by a positive. In regard to what Dr. Arthur said on the question of pathology, he did not attempt in the paper to present an exhaustive treatise on the pathology of constipation; it would have taken too long to deliver; but he confined his attention to setting out the forms of electrical treatment he had employed. In answer to Mr. Bokenham, he had not had experience with the Morton wave current. He would like to hear evidence of its value. If a wave of that kind were used, it should be a slow wave, not a fast one. He had not performed the experiment mentioned by Dr. Pirie, namely, giving bismuth and testing the periodic time of the muscular coat of the stomach with the assistance of X-rays, and he doubted whether he would find a patient willing to stand it. By the time the latter was in the dark tent, and the high and low tension currents had been arranged and

applied, he (or she) would have had quite enough. The difficulty regarding the de Watteville current which Dr. Pirie mentioned was due to his having connected the coil, battery and patient all in parallel. The coil being of lower resistance than the patient, a large current from the battery passed through it, the patient getting very little. If he rearranged the connections so as to join up coil, battery and patient in *series*, he would find everything all right. What Dr. Batten referred to was a modification of what he (Dr. Morton) spoke of, and, as stated before, it was an advantage to have the muscle alternately charged, because electrolytic action was not required and a higher stimulating effect was obtained by reversing. He had not applied the current in baths for atonic conditions of the digestive system; he had always used electrodes. He did not approve of simply laying the patient on two electrodes and letting the other rest on the stomach; it was necessary to take the anterior electrode and sink it well into the abdominal wall, as far as the patient would allow. To get the best results the operator must do some work himself. He used one electrode on each side of the lumbar spine—about 15 cm. by 9 cm. was a convenient size. He could quite see that the use of a bath for the pulsating current would be a slight advantage, and would eliminate the chance of damage to the skin; but much current was wasted, and one did not know how much went through the patient. Theoretically, in the ideal electric bath pure distilled water should be selected. It would give such a high resistance that the current would pass by preference through the patient. He had not yet come across those unfortunate individuals who had had their intestines short-circuited, and he did not know how his particular method would answer with them. He had not had experience of high frequency currents in true atony, but he had used high frequency where constipation was an element in a case of neurosis, the latter being so pronounced that he did not give much attention to the abdominal trouble. He put the patient on a condenser couch and used an ordinary metal electrode across the stomach, connecting it with the top of the resonator. He and the patient were both pleased with the result.

Electro-Therapeutical Section.¹

May 22, 1908.

Mr. W. DEANE BUTCHER, President of the Section, in the Chair.

Interrupted Currents for Electrical Testing and Treatment.

By H. LEWIS JONES, M.D.

OUR views as to the best modes of applying electrical currents in medical treatment are showing signs of an impending change. The period during which the time-honoured faradism and galvanism have held sway has been a long one, and when we remember how electrical science has developed since they first came into medical affairs it is difficult not to feel that it is time to take a fresh step forward.

In the matter of the principles which we use to guide us in the choice of current, things have never been completely satisfactory. Our reasons for the choice of "faradism" for one case and of "galvanism" for another have oftentimes been as unconvincing as the results of their use have been unsatisfactory. We have pounded away at weak and paralysed muscles with induction coil currents, and have been forced to sigh at the slow rate of improvement which the aforesaid muscles have exhibited under such a regime. We have treated painful affections, such as perineuritis and neuralgia, in the same way, and, I am sure, have often made our patients actually worse instead of better. There is no need for me to bring forward specific instances, for I expect that many of those here present can recall such from their own experience; and if we consult the authorities on the treatment of, let us say, infantile paralysis, we find that while one recommends interrupted or alternating currents, another, perhaps equally experienced, will declare for continuous currents, and will assert that interrupted currents are useless for the treatment of muscles if a reaction of degeneration be present.

¹ Meeting held in the Rooms of the Royal Philosophical Society, Glasgow.

We, as students of electro-therapeutics, are confronted by the urgent need of improvement in our methods and in our results if we are to receive serious consideration from our colleagues who practise other branches of medicine and surgery. Our field of work is a painfully restricted one in reality, although in appearance it is ready to embrace almost the whole domain of therapeutics. As I have pointed out on a former occasion, we need work upon a higher plane than that in which the competition of the nurse, the medical rubber, or the quack can be encountered, and it is in this higher class of medical work that our progress in the future must lie.

In all electro-therapeutic procedures we ought to know precisely what we are aiming at, and should also have a reasonable expectation of realizing it. It seems to me that unless there is a satisfactory likelihood of our obtaining the desired result by electrical means, it is better to decline to undertake a case. In the electrical stimulation of nerve and muscle in cases of paralysis, and in all procedures of general electrical stimulation for states of debility or defective nutrition, there is no doubt at all that a slow periodic current with intervals of rest is far better than a sustained tetanization. This was demonstrated by Debédat in 1894 by a series of experiments on the muscles of rabbits, from which he found that induction currents rhythmically applied for four minutes daily with periods of one second, followed by one second of repose, gave a large (40 per cent.) increase of weight in the muscles treated, whereas induction currents applied for the same time daily without rhythmic intervals, so as to produce a sustained muscular contraction, caused a loss of weight in the muscles so treated. I am of the opinion that for a large proportion of the cases which come for electrical treatment it is of advantage that rhythmically varying currents should be used, both when interrupted currents are employed and when direct currents are to be made use of, the most notable exception to this rule being in the employment of electrolysis, whether as a destructive agent for nævi, &c., or as a means of ionic medication. In almost everything else the currents must be rhythmically interrupted.

A few years ago the term "interrupted currents," when used in medicine, meant simply the currents of the medical induction coil. Now the sinusoidal current of the alternating supply mains has come into general use as an additional form of medical current, and the employment of currents varying rhythmically at a slow rate is gradually extending. I believe that it is to St. Bartholomew's Hospital that we owe the introduction of the rhythmic current into practice in this country,

just as it is to St. Bartholomew's that we owe the now universal arm-bath as a medium for electrical applications. The use of rhythmic currents was commenced at St. Bartholomew's a number of years ago with an apparatus consisting of a metronome which carried a wire swinging to and fro, and in its excursions dipping into and out of a vessel of liquid through which the current passed. The variations so produced in the resistance of the liquid part of the circuit gave the required rhythmically varying character to the current. This apparatus, or an illustration of it, is probably familiar to most of you, but it presented certain inconveniences, and has now been given up.

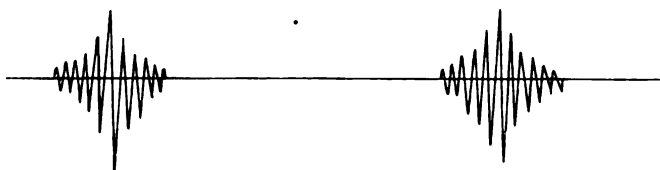
Following the metronome, another clockwork contrivance was used, the principle still being the same, namely, a variation in current by a variable liquid resistance. It consisted of a wire which dipped into a dilute saline solution, and the range through which the resistance could be caused to vary was increased by the following simple device: In the vessel of liquid a small glass funnel was inverted, and the moving wire entered the liquid through the narrow end, the level of the liquid coming well up into the stem of the funnel. This gave better regulation.

I may digress for a moment to point out the necessity of proportioning the resistance of the variable part of the circuit to suit that of the working part. A rheostat designed to reduce a current to, say, one-tenth of its maximum value must have a resistance ten times that of the rest of the circuit to be regulated, and thus it follows that when three arm-baths are arranged in series, the resistance to regulate them must have a range from maximum to minimum which is ten times the resistance of the three baths, or thirty times that of one arm-bath. It is this fact which limits us in the use of liquid cells for resistances, and has made the inverted funnel so useful in the arrangement under consideration. Without it, it is difficult to secure a sufficient difference between the strong and weak part of the cycle except by allowing the wire to come out of the liquid and so to break the circuit abruptly, but with the funnel the wire recedes upwards into its stem, and the liquid part of the circuit at that point is of relatively small cross section, and therefore has a relatively high resistance.

These clockwork resistances are valuable for treatment because they are cheap and easy to make, but they need attention and adjustment, and on these grounds the forms of variable resistance driven by an electric motor are superior. Before going on to a consideration of these, I wish to call your attention for a moment to another form of simple resistance which has some useful applications. It consists of a simple

ebonite water tap containing water or a conducting liquid, and connected in the circuit to be regulated. The turning of the tap, by changing the area of the orifice, changes the resistance within a large range, and the contrivance is useful when current is to be slowly raised or lowered, as is done in the treatment of certain conditions, particularly in applications of electrical currents to the head.

Of more ambitious machines for producing slow waves of current, I wish to mention two. One is particularly useful for the currents of an alternator or of an induction coil, and consists of a sledge coil transformer with an electric motor to set the secondary coil in motion to and fro over the primary. A very well designed instrument of this kind is made by the firm of Gaiffe, in Paris, and works well for long hours daily in the electrical department at St. Bartholomew's. Its wave form on an alternating circuit may be represented as follows:—



The other, made by the firm of Schall, is a wire resistance upon which a metal traveller slides to and fro, causing the current to increase and decrease as it slides. It may be used to regulate interrupted currents or to convert direct current into slow pulsating waves, or, finally, by adjusting the connections, it may be made to convert direct current into slow alternating waves with a duration of a second or thereabouts. Lastly, I wish to mention Dr. Morton's slow moving motor generator, which gives out sinusoidal current of very slow periodicity, though hardly so slow as those of the machine last described. Dr. Morton has found his apparatus valuable for treatment, and he considers that it may well be used to take the place of the three-phase currents of slow periodicity which have been recommended in this country by Dr. Herschell.

I come now to another form of interrupted current apparatus which I think everyone should know, namely, the interrupter of Leduc. Its essential value consists in the power it gives us of producing currents of definite wave form and duration, and of varying these at will within wide limits.

It consists of a motor-driven commutator with its two brushes, the current to be interrupted passing from brush to brush through the commutator segments at one time and being broken at another, the periods of flow and of no flow being determined by the relative positions of the metallic segments of the commutator and the brushes. When these form a circuit from brush to brush the current flows, and when they do not there is an interval. By the ingenious device of altering the position of one brush from its most advantageous position the duration of the flow can be shortened so as to obtain short impulses with longer intervals, and experiments with this interrupter promise some useful results in electrical diagnosis. Thus, by arranging the brushes to give long waves one may obtain a tetanic response in muscles which are unable to respond in that way to short waves, and this opens out a very important possibility in electro-diagnosis, namely, the possibility of a further analysis of the cases which are now grouped indiscriminately together as cases showing a reaction of degeneration, and the advantages to be derived from such an analysis or splitting up of a somewhat heterogeneous group of cases will be manifest to all.

The instrument I show here has been made for me by Mr. Leslie Miller, and is fitted with a speed counter, so that the number of revolutions per minute can be read off at any time. The duration of each wave can also be measured by observing the milliamperemeter with the apparatus stationary, and comparing the reading with that observed when it is running, for the fall in the magnitude of the reading gives a measure of the fraction of time during which no current flows. Thus, if at rest the reading is 10 ma., falling to 1 ma. when running, we assume, and assume correctly, that the current flows only for one-tenth of each cycle. The number of cycles per minute being obtained from the speed counter, the duration in time of each impulse is easily calculated.

I hope at some future time to deal more at length with this apparatus, which I consider to be very valuable, and content myself to-night with drawing attention to its capabilities.

**Some Reflections based upon the work done in the Electrical
Department of the Royal Infirmary, Edinburgh.**

By DAWSON TURNER, M.D.

GALVANIC and faradic currents were the first to be used for electrical treatment and diagnosis in the Edinburgh Royal Infirmary, bichromate and Leclanché cell batteries, and occasionally Bunsen's, when an aneurysm had to be treated electrolytically. So matters jogged on for years, and there was no separate electrical department or even room; but the discovery of the X-rays gave a great impetus to medical electricity. Three rooms were set apart, and a static machine and an X-ray apparatus were installed, and later on a high frequency spark gap and resonator. Now the department consists of twelve rooms, and it occupies the whole of one floor of a pavilion. But with the swing of the pendulum we are now returning to continuous currents again, and my time is mainly spent in the galvanic room.

I will make a few remarks in turn upon the apparatus used and the work done by us in these different branches of electrical practice. In the static room we have a twenty plate Gaiffe ebonite machine and a six plate glass machine; we can treat three or four patients at once, and there is a daily attendance of about nine. The treatment seems to be of most service as a tonic agent in neurasthenia and in those recovering from exhausting diseases; but it is also of use in obscure painful conditions. Patients are apt to contract a habit for the treatment, and to continue it for too long a time. I will not say much about high frequency currents; they have had rather more than the usual rise and fall associated with the introduction of new remedies—received with too much enthusiasm at first, and pushed by quacks and interested instrument makers, they now seem to be taking their proper place, chiefly as a means of treating certain painful conditions, such as sciatica. In my own opinion, which I have held since Tesla first introduced these currents, their chief and most valuable action is one of counter-irritation due to the innumerable minute sparks which pass between the electrode and the skin. Turning now to the Röntgen ray department, the tubes that we are using just now for radiography are Bauer air-cooled ones, and for treatment Cossar's therapeutic tubes and

Dean's tubes. The Bauer tubes are satisfactory, but if pushed may overheat and fall very suddenly in vacuum; on the other hand, they are also sometimes difficult to soften. The favourite plates with us now are Jougla and Ilford, but I cannot say that I have found them markedly superior to others. Each of our coils is furnished with two interrupters connected in parallel; either of these can be used at will by the movement of one switch. To avoid overheating the tubes we do not attempt to use very short exposures, in fact the time of our exposures has remained sensibly the same for the last year or two. On an average seven photographs and ten cases are treated by the X-rays daily. Screen examinations have, owing to the risk of dermatitis or other injury—and we do not yet comprehend all the ills they may occasion to those constantly exposed to them—fallen into desuetude. Whereas formerly cases were almost as a matter of course and with keen interest at first examined with the screen, now a screen examination is an exception, and to be made only in special cases. The staff at the Edinburgh Royal Infirmary are all suffering more or less from dermatitis. A word or two about a screen examination. It has been suggested that the reason why we cannot see the detail on a screen that we can on a negative is owing to the fact that the negative looks longer and accumulates impressions, just as it does also in case of the stars, but I think the real reason, as has been pointed out by Beclère, is that we examine the screen image by a dim light and the negative by a good light, for the part of the retina that is most sensitive to a dim light, and also to certain colours, particularly blue, is the periphery, the sensibility increasing as we leave the yellow spot; thus it is sometimes an advantage to examine a screen image with the eyes not directly fixed upon it; but when you examine the negative you use the yellow spot, the point of distinct vision, because you can use bright daylight, and it is only by using the yellow spot that fine details can be made out. I need say nothing about the value of the X-rays in diagnosis, both medical and surgical, but what view is a calm and unprejudiced observer to take of its value in treatment? In dermatology it ranks high in tinea tonsurans, favus, and mycosis fungoides. It is not so successful in Scotland in tinea as it seems to be in France, but Dr. N. Walker recommends it highly in favus. Whether, however, one is justified in treating children suffering from ringworm or favus with the X-rays is a reflection I am bound to make, and in my own opinion the answer must be in the negative. I would not allow any child of mine to run the risk of having the development of the delicate

cells of its growing brain interfered with or arrested. The remedy may prove to have been a thousand-fold more serious than the disease. In adults, and when not applied to the brain, this risk is at any rate avoided. The rays are of service in superficial malignant disease, in epithelioma and scirrhus, and I have seen several cases of sarcoma in which great relief and prolongation of life have been obtained. Have I ever seen a cure—say no recurrence for two years? In two cases (about 1 per cent.); one of these was a recurrent epithelioma on the back of the hand. The growth had been removed by the late Professor Annandale and examined microscopically. Twenty-six séances sufficed to cause a complete disappearance. The second case was a recurrent scirrhus; the patient received a severe X-ray burn which caused her great pain and distress for more than a year, but the disease seemed to be eradicated. For deeper inoperable neoplasms the rays can, *faute de mieux*, be tried, and in some cases undoubtedly do good.

J. G., aged 52. Diagnosis: Malignant disease of stomach (made by Dr. Boyd). Admitted April 6, 1904. History: Present condition commenced in December, 1903, with pain in the stomach and nausea; the day after this he had vomiting; since then pain and sickness have been constant, always worse after food; palpation brings out a mass in the stomach measuring $3\frac{1}{2}$ in. in length. Treatment: X-rays daily for five minutes over epigastric region.

April 9: Pain much relieved, sickness entirely abated. April 13: No pain whatever; patient conscious that the tumour is decreasing in size. April 29: Feels well and strong; no pain or sickness; leaves for home. August 23: Returned on this date; a fortnight previously a recurrence of former symptoms; a large tumour can be felt with secondary growth in left lobe of liver. August 27: Feels much relieved. September 10: Pain and sickness all gone, but tumour not decreasing as fast this time. September 30: Continued improvement and gaining weight; patient is apparently quite well and has no discomfort; leaves for home. October 19: Reported himself on this date; continues to enjoy good health, no pain or sickness whatever, and gaining weight; the HCl, which had disappeared from the stomach, has returned.

In rodent ulcer the results are good, but very slow compared with electrolysis; we, therefore, have given up the X-ray treatment of rodent. For very small rodents radium acts like a charm, but recurrence is the rule. In leukæmia the results appear to be favourable—I say appear to be because the long exposures may, and I venture to say probably do, produce untoward effects on the kidneys and other organs. I have notes of several cases in which great improvement occurred; the spleen becomes reduced in size, the red corpuscles increase, and the white corpuscles diminish in number; the patient feels much stronger and

better. This is the usual effect of the X-rays applied over the splenic area and long bones. Unfortunately the disease recurs when the treatment is interrupted, and I have records of cases which have returned two or three times for treatment.

J. L., aged 28. Spleno-medullary leukæmia (Dr. Gibson). Admitted February 28, 1905. History of nine months, commenced with an ovaritis. Treatment carried on daily till June 16, 1905. Blood-count on admission: Red corpuscles, 2,590,000; white corpuscles, 400,000; hæmoglobin, 41 per cent.

March 21: White corpuscles, 320,000; hæmoglobin, 66 per cent. May 2: White corpuscles, 27,000. Some dermatitis set up and treatment stopped for three weeks: splenic area alone exposed. June 16: Red corpuscles, 4,090,000; white corpuscles, 9,800; hæmoglobin, 95 per cent.

Readmitted on April 16, 1906. Patient has kept well since she went home, but owing to recurrence of former symptoms has returned. White corpuscles, 380,000.

June 6: Not doing so well this time; white corpuscles, 780,000; hæmoglobin, 42 per cent. July 6: Marked improvement in the last month; all the long bones treated in addition to spleen. Red corpuscles, 4,260,000; white corpuscles, 124,000; hæmoglobin, 73 per cent. August 20: Discharged.

M. S., aged 27. Spleno-medullary leukæmia (Dr. Gibson). Admitted March 8, 1906. History that in November of previous year patient had influenza and immediately after became aware of spleen being enlarged. Treatment daily to splenic area and long bones. Blood-count on admission: Red corpuscles, 2,830,000; white corpuscles, 200,000; hæmoglobin, 56 per cent.

May 6: Red corpuscles, 3,800,000; white corpuscles, 9,660; hæmoglobin, 42 per cent. May 15: Red corpuscles, 3,540,000; white corpuscles, 11,900; hæmoglobin, 46 per cent. June 8: Spleen much reduced in size. Red corpuscles, 4,500,000; hæmoglobin, 76 per cent. July 7: Patient leaves for home; spleen practically normal; leucocytes, 1 per cent.

This patient remained in good health for ten months and was able to work. She returned for treatment as spleen was enlarging, and after a course of exposures extending over six weeks again went home apparently cured.

In lupus the rays do good, in lupus of the palate and larynx also. Dr. Logan Turner recently showed a case of laryngeal lupus treated by me which he considered to be cured. In tubercular glands, joints and bones, slow benefit may occur. There are known risks in lupus, for epithelioma may follow; Dr. Norman Walker states that in seventy-two cases of lupus treated abroad by X-rays, ten developed epithelioma. In a case, treated in my department, of lupus of the cheek, epithelioma followed. Finally, I think the therapeutic use of the X-rays is potent both for good and evil, but particularly for evil, for the good effects are often transient, as in leukæmia, but the evil effects may be permanent

and incurable ; and while its use may be freely indicated in malignant disease, yet its employment in less serious conditions should not be lightly undertaken ; its possible risks should be explained to the patient, and its effects should be most carefully watched.

In another room we have arm- and leg-baths supplied by a Morton slow-running triphase sinusoidal machine for the treatment of local paralysis and of sprains, and for the restoration of function. These baths do more good in writer's cramp and trade spasm than any other form of electrical treatment I am acquainted with.

Lastly, we have a general electrical room fitted with three Milne Murray switchboards ; these were actually made by the late Dr. Milne Murray. They are used for testing electrical reactions and for faradic and electrolytic treatment. It is in electrolysis or ionic medication, for the reintroduction of which we owe so much to Professor Leduc in France and to Dr. Lewis Jones in this country, that I think most progress will be made in the future. Some of the conditions for which electrolysis may be advantageously applied are as follow : ankylosis, sclerosis, fibrous adhesions, strictures, rodent ulcer, parasitic affections, sinus and fistula, tic douloureux, rheumatic and gouty affections. Eight cases of ankylosis of joints have been treated by me with chlorine electrolysis, and all have improved. I will refer to one case : A. B., under the care of Mr. Cotterill, a case of ankylosis of the left knee ; patient met with an accident, which resulted in a septic condition of the knee ; he was in bed for fifteen weeks, the knee became stiff and could not be flexed to more than a right angle. The knee was now treated with chlorine electrolysis, and every application resulted in greater freedom of motion ; after three applications his foot could move through an arc of 7 in. more. A continuance of the treatment led to almost complete restoration of function, but at a slower rate of progress. The treatment should be immediately followed while the tissues are in a relaxed and supple condition by forcible movements. Four cases of Dupuytren's contraction fingers have been similarly treated with very good results ; in the case I show you the disease had lasted fifteen years, the forefinger was bent to more than a right angle, and resembled a hook. Each treatment loosened and eased the contraction, and after eight séances of half an hour each the finger could be straightened. The patient then ceased to attend, but returned in about six weeks with his finger bent again, but not to the degree that it had been previously ; a resumption of the treatment had the same effect as before. It is difficult in these cases to pass sufficient current through the skin

over the contracted tendons without the current density becoming too great; this may result in a burn. Long séances with small currents are therefore advisable. Skin contractions and cicatrices following burns are, as might be expected, very amenable.

Another class of case in which I have had some small success is that of sclerosis of the spinal cord. Five cases have been under treatment: one of tabes dorsalis, two of spastic paralysis, and two of disseminated sclerosis. As a rule I place over the affected area of the cord ten layers of lint dipped into a weak solution of NaCl, and over this a metal electrode attached to the — pole; the feet may be placed in a bath attached to the other pole; a strong current is now passed for half an hour or more. By using a linear electrode some part of the current will traverse the affected segment, there will be an interchange of ions and the action of the chlorine ion will have a loosening and resolving effect on the sclerotic tissue, so that nerve impulses will be conducted more freely. The first case of spastic paralysis, aged 34, had been ill for more than a year; he presented all the signs and symptoms of spastic disease; he was not able to walk alone and suffered from urinary incompetence. Six séances sufficed to remove these symptoms, and under a continuance of the treatment he was soon able to walk quite well by himself. After reaching this stage of improvement the applications were discontinued and the patient was advised to remain quietly at home. Unfortunately he returned to his work and his condition became worse. A repetition of the former applications now failed to relieve him, but when stronger currents were employed the patient steadily improved and was soon brought back to his former level. The second case also improved steadily but then had a relapse. Of the two cases of disseminated sclerosis one showed some improvement and the other seemed to derive no real benefit. The case of tabes, aged 39, a patient of Dr. Gemmel, has had about four applications and the effect is still *sub judice*; but he says that he always feels better and stronger after the treatment. The most striking feature in all these cases is the temporary recovery of power following each application; the patient can walk and use his limbs more freely. Of all the ions that can be introduced electrolytically that of zinc appears to be of most general use. I show you some slides to illustrate its effects in rodent ulcer.

The first slide is that of D. H., aged 61, a patient of Dr. Maclaren, taken before electrolysis; the next slide was taken three weeks after the first application of electrolysis; he was now treated again, and the next slide shows his condition three months later. Thus two

applications of zinc electrolysis sufficed to cure this case of rodent ulcer of the nose. The next two slides exhibit the condition of a patient of Dr. Laing's before treatment and after three applications; the lupoid ulcer has practically disappeared. The next slide is that of W. H., a patient of Mr. Dowden's, with a rodent ulcer of fifteen years duration. Two years before, when it was smaller, fourteen weeks treatment with X-rays had caused it to heal; it recurred, and on admission in January, 1908, the ulcer measured 3 in. by 2 in. Six applications of zinc electrolysis sufficed to cause it to heal. The next slide is that of a strumous ulcer before and after treatment. A sinus yields readily to the same treatment if plugged from the bottom. Cases of tic douloureux and neuralgia are very amenable to the salicylic ion, which, indeed, often acts like a charm.

Lastly, I am sometimes asked to assist a surgeon in the electrolytic treatment of aneurysm. The late Dr. John Duncan used to introduce both poles (steel needles) into an aneurysm and pass a current of 30 ma. for twenty minutes. The modern method is that known as the Moore Corradi, and it consists essentially in the introduction into the aneurysm of several feet of wire and of the passage of a current through the wire into the blood; the other electrode is placed on an indifferent spot. The wire is always made the + pole, and this for two reasons: (1) To obtain a firmer clot, (2) to diminish the risk of emboli, which might result from the multitudinous bubbles given off at the - pole. The wire used may be of silver, gold, platinum, or iron. Dr. Stewart, of Philadelphia, says: "Gold, silver, or platinum wire is undoubtedly the preferable material." Professor Leduc has, however, stated¹ that zinc is the best coagulant and far superior to platinum. This experiment of his I have been repeating and examining on an extended scale. I have had a number of electrodes of different materials made, and I have compared the results obtained by electrolyzing blood-serum. I should like to show you one or two experiments, for they are very striking. The net result is that with none of the metals recommended is any coagulum worth the mentioning to be obtained. Further, in some cases much gas is evolved even from the + pole, so that some surgeons have been unconsciously courting the very danger they were endeavouring to avoid. We may draw the conclusion that this danger is nothing but a bogey. With zinc electrodes you notice that no gas is given off at the + electrode, but that a firm glove-like coagulum is formed. This coagulum adheres to the electrode, and if shaken off

¹ "Les Ions," p. 28.

preserves its form. Hence I venture to suggest that surgeons should introduce zinc wire into an aneurysm which they wish to treat electrolytically rather than the wire recommended either by Dr. Stewart or other clinical authorities who have not tested the coagulating effects of these metals experimentally in the laboratory, for my experiments convince me that the passage of an electric current in the orthodox Stewart Moore Corradi method in no way aids in bringing about coagulation of the blood, but serves mainly to exhaust the patient's strength and consume valuable time and energy, while whatever coagulation is produced is due only to the introduction of the foreign body.

Ionic Medication in the Treatment of some Obstinate Cases of Pelvic Disease in Women.

By SAMUEL SLOAN, M.D.

IONIC medication is the application of electro-chemistry to therapeutics. To students of recent advances in physical chemistry, chemical affinity comes simply to mean electric attraction and electric repulsion of the atoms or molecules in solution. These atoms or molecules have each a charge of electricity, some of them being positive and some negative. Being electrically charged, and capable of moving in virtue of this charge, they are called ions or movers. Let an electric current be passed through such a solution and at once, from a restless state of activity, the ions proceed to arrange themselves so that the — ions may move towards the + pole and the + ions towards the — pole; like charges repelling and unlike attracting. The ions moving towards the + pole are called anions, that is anode-goers; those towards the — pole kathions, that is kathode-goers. Hydrogen and all metals are kathions; iodine, chlorine, &c., are anions. In the case of compounds the bases are kathions and the acids are anions. Thus, in the case of a solution of sulphate of copper, the sulphuric acid, being an anion, will drift towards the + pole; whilst the copper will move towards the — pole. Any solution capable of conducting a current of electricity through it is called an electrolyte; and the passage of the current brings about decomposition of the electrolyte. The motions of the ions constitute the current, each atom carrying with it an equal quantity of electricity. The human body is an electrolyte in virtue of the salines in its tissues. The principal saline being NaCl, the body acts electrically as a solution of chloride of sodium.

Seeing that the ions or electrically charged atoms are some + and some —, and that these are capable of moving freely about and against each other, there must be a constant commotion amongst these ions. This is shown at A in fig. 1,¹ which is meant to illustrate diagrammatically the arrangement of the molecules and atoms of water when uninfluenced by an electromotive force from the outside. Note how the molecule has its atoms so arranged that the mutually repelling H ions are kept as

¹ Not reproduced.

far as possible apart, so that there would be no movement within the molecule but for the action on its atoms of adjoining molecules. It is a different matter, however, as you will observe, with the molecules themselves, for, where these are so placed that two H atoms approach each other or collide, repulsion will follow between the molecules, and, though in less degree, between the H atoms within the molecules also, due to the partial displacement of one of these by an H atom of an adjoining molecule. Let a small controlling force, however, say 1 volt, be applied, and instantly the molecules arrange themselves as at B, so that all the O atoms point towards the + pole and all the H atoms towards the -- pole, but no decomposition takes place. Let at least 2 volts of difference of potential, however, be brought to bear on the atoms of the water and we have what is represented at C. The atoms have changed partners all along the line, so that at the + pole an atom of O has broken off, and at the - pole two atoms of H. In the case of water the atoms of the molecules are held together more firmly than are those of some other electrolytes, for, though a slight difference of potential between the electrodes inserted into the water would tend to make the molecules stand at attention as in B, it requires over 1.47 volt to bring about what is shown at C, the O and H having a strong attraction for each other. Expressed chemically the O and the H have a strong chemical affinity for each other; expressed electrically their difference of potential is high, just as the inherent difference of potential between Zn and Cu when brought into contact is relatively high. The constituents of some electrolytes have much less affinity, however, for each other. In such cases the movements of the ions must be more vigorous, not only amongst the molecules but also amongst the atoms. An atom may break off from one molecule to attach itself to an adjoining one, or it may roam about free and be caught up for a time again; but movement is constant, causing commotion from collisions amongst the ions. That this is the case, especially with a solution of NaCl, was forced upon my notice recently whilst investigating some electro-chemical phenomena. I took a U-shaped tube containing normal saline solution, placed a carbon electrode into the solution in each limb, and connected these electrodes with a galvanometer giving milliamperere readings. The result surprised me when I first observed it. It may be well known to electro-chemical experts, but it was previously unknown to me. Note that these carbon electrodes have no difference of potential, and therefore no migrations of ions towards the separate rods might be expected; yet no sooner had the rods touched the solution than a current of 1 ma.

was found to be set up in the galvanometer. I show you this now. I suspected, as an explanation of this phenomenon, that the carbons might differ in potential owing to some impurities in one of them, since, when I reversed them in the limbs of the U tube I found that the direction of the current was reversed. That this was only occasionally the case, however, was evident after a few trials, the direction of the current varying apparently according to mere chance. That this is so is indeed most likely; and imagination can readily picture atoms breaking off from their molecules, rushing about in a free state, reuniting, changing partners, and darting off again. Like "warlocks and witches in a dance," "They reel'd, they set, they cross'd, they cleekit," as Tam O'Shanter saw done at the midnight ball in Alloway Kirk. Under such circumstances there must always be some free ions in the neighbourhood of the carbon electrodes. Let a few + ions happen to knock against one of the carbons in its rambles; these will give up their charge of electricity to that electrode, which will then become electro positive, and thus will a difference of potential be established between the carbons. All the more will this be the case if some of the - ions are at the same time similarly surrendering their negative charge to the other electrode. Thus a current is set up between the electrodes outside of the solution; and, as this current must pass through the galvanometer, its needle is deflected. The current, once formed, continues, I find, to circulate for an indefinite time, though gradually falling to about $\frac{1}{2}$ ma. The potential I found to be about $\frac{1}{5}$ volt. It is not to be wondered at, therefore, that a solution of NaCl should be a good conductor of electricity compared with water, which, if perfectly pure, is almost a non-conductor, due to the close electrical union between O and H, for no decomposition means no current, and the conductivity of a fluid is proportional to the number of its free ions multiplied by the velocity of their movement.

Whilst this illustration appeals to the imagination and helps to give a living picture of ionic movements, a simple experiment illustrating the decomposition of KI appeals to the eye. [Experiment here with a U tube containing a solution of KI, starch and phenolphthalein.] The starch, you will observe, is colourless because there is no free iodine; the phenolphthalein is colourless because there is no free potash. Now apply to one limb of the tube the positive pole from a battery and the negative pole to the other and note the change. In a few minutes the solution in the limb into which is inserted an electrode connected with the + pole becomes blue, indicating the presence of free iodine; whilst

the solution in the other becomes red from the action of the K on the phenolphthalein; the metal potassium, separated by the current, having combined with hydroxyl, whilst the other atoms of H of the molecules of the water escape, as you may see from the bubbles arising from this pole. A reversal of the current would result in the colours changing places. Note also that these changes are at the electrodes only. Changes such as those shown in Table I. have been going on. I show the potassium and the iodine only in this table to make the process less complicated. Observe also the iodine atoms at the one end and the potassium atoms at the other have parted with their electric charges to their respective electrodes and have thus become free. This is electrolysis, and is, as you see, accompanied by ionic migration, but it is not ionic migration in the sense in which we are considering it to-night. In electrolysis the changes, as you will observe, are at the poles only, though this has been brought about by the ions throughout the liquid constantly changing partners and going individually their respective ways.

TABLE I.

Simple Electrolysis

+	$\begin{array}{cccccccc} + & + & + & + & + & + & + & + \\ \text{K} & \text{K} & \text{K} & \text{K} & \text{K} & \text{K} & \text{K} & \text{K} \\ \hline \text{I} & \text{I} & \text{I} & \text{I} & \text{I} & \text{I} & \text{I} & \text{I} \end{array}$								—
	Before current.								
+	$\begin{array}{cccccccc} & & & & + & + & + & + \\ & & & & \text{K} & \text{K} & \text{K} & \text{K} \\ & & & & \hline & & & & \text{I} & \text{I} & \text{I} & \text{I} \end{array}$								—
	After current.								

Simple electrolysis has been employed in medicine for various purposes, notably by Apostoli in gynaecological cases; and this treatment is sometimes of undoubted benefit. The escape of nascent O and of the acids of the tissue electrolyte at the + pole, usually the intra-uterine one in the Apostoli treatment, has an antiseptic or a caustic action; whilst when the — pole is made the active one the tissues are softened and dissolved by the action of the sodium hydroxide, obtained from the NaCl of the tissues and the hydroxyl of the split molecule of the water. In ionic migration phenomena, however, there is besides this a transfer of the ions of the applied solution or soluble electrode from one pole in

the direction of the other, of zinc or copper as the case may be from the + pole, and of iodine, sulphuric acid or salicylic acid as the case may be from the - pole. The question as to which pole the substances leave is the important one because, in applying ionic medication in practice, the other pole is at a neutral place, and so it may be for convenience ignored. Table II. illustrates what would go on in the case of copper, when applied at the + pole, as Table III. indicates how KI would behave when applied at the - pole.

TABLE II.

Ionic Migration.

		Mucous membrane											
+		+	+	+		+	+	+	+	+	---		
		Cu	Cu	Cu		Na	Na	Na	Na	Na			
		-	-	-		-	-	-	-	-			
Before current.													
		Mucous membrane											
+						+	+	+			—		
						Cu	Cu	Na	Na	Na		Na	
						-	-	-					
	Cl	Cl	Cl	Cl		-	-	-					
After current.													

TABLE III.

Ionic Migration.

Mucous membrane													
+	+	+		+	+	+	+	+					+
K	K	K	|	Na	Na	Na	Na	Na					
I	I	I	|	Cl	Cl	Cl	Cl	Cl					
Before current.													
Mucous membrane													
				+	+	+							+
K	K	K	|	Na	Na	Na							
			|	I	I	I	Cl	Cl	Cl	Cl	Cl		
After current.													

As ocular demonstrations of the power of electric currents to cause the transit of ions from the pole of application, I show you some pieces of leather which have been suitably folded and tied round one end of an

open glass tube. This tube has been inserted into a vessel containing a solution of NaCl, whilst the substance employed to penetrate the skin is poured into the inner tube. A current of electricity has been passed through the folds of leather for a definite time. As a contrast I have placed alongside each of these a strip of the same material which had been similarly treated, but without having had any electric current passed through it. In this latter case simple diffusion had been in operation for exactly the same time as in the former. In the case where CuCl_2 has been the substance employed, solution of sulphurated potash has been used to convert the comparatively colourless CuCl_2 solution into the dark sulphide of copper. In this case both solutions were of the same specific gravity and stood at the same level, so as to eliminate the actions of osmosis and of gravity. Where salicylate of soda has been the substance used, tincture of perchloride of iron has been employed to render visible the passage of the salicylic acid from the — pole through the layers of the skin. In this case transudation has been opposed by gravity and by osmosis, the solution in the inner tube being at a lower level and of a lower specific gravity than that of the outer one. This explains why the markings on the skin, which indicate the amount of simple diffusion, are those of the reagent only, practically no salicylic acid having passed through. In the case of ionization, on the other hand, though the other conditions were identical, the salicylic acid, as you will observe from the intense red of the action of the reagent upon it, has penetrated to the last fold of the skin.

It will readily be admitted that, if this difference can be produced by electric means, a similar result may be expected in the case of the mucous membrane of the vagina and uterus, the conditions there as to gravity and osmosis being practically the same as in the salicylic acid experiment. But the difference is not one of degree only, for whereas in the case of simple diffusion the substance will, in ordinary circumstances, pass into the inter-cellular spaces only, and be at once carried off by the blood- and lymph-streams, in the case of electric transudation, on the other hand, the ions penetrate into the protoplasm of the cell itself. No lodgment of micro-organisms can therefore escape the action of the drug. The effect, of course, will be either germicidal or simply antiseptic, according to the quantity of current employed. In estimating how much of the substance has penetrated a membrane it must be borne in mind that each atom carries the same quantity of electricity; but as these atoms differ in atomic weight the amount will be directly as the current and directly as the atomic weight. It will also be directly as the

time during which the current has been allowed to flow. What is called the electro-chemical equivalent of an atom is the amount deposited by 1 amp. in one second, so that the transfer from 15 ma. acting during twenty minutes will be the same in amount as would be yielded by a current of 30 ma. acting for ten minutes.

Before proceeding to record the results of my treatment of obstinate gynecological cases by ionic medication, let me explain that these cases have been obstinate, not in the sense of being obscure, difficult to diagnose, or fit for treatment by the gynecological expert only. Far from being so, they were all such as the general practitioner is probably treating every day in his practice, and, if he is satisfied with my results, he can easily himself carry out the treatment I have employed.

Most of the cases of disease of the pelvic organs in women arise from a septic condition of the genital tract and its consequences. That present-day treatment for many of these diseases leaves much to be desired goes without saying. This is evidenced by the frequent and long-continued visits of semi-invalid women to the doctor's consulting-room, varied occasionally by a stay of a week or two at a nursing home and a probable operation requiring the administration of chloroform. Let me quote from an excellent treatise on "Medical Gynecology," just published by Professor Howard A. Kelly, to prove that I am not exaggerating when I make these statements. My gynecological colleagues will admit that this author is skilful, reliable, and thoroughly up to date. The sole treatment he recommends for endometritis, including the hæmorrhagic form, is, as might be expected, curettage. Chronic septic cervicitis he rightly characterizes as one of the most obstinate of all gynecological affections. Patients subjected to mild treatments by applications for this affection, he says, "will be obliged to frequent the office of the doctor year after year without gaining any substantial relief." In his opinion the only effective treatment is the actual cautery, repeated from once in ten days to once in two weeks. For chronic vaginitis he finds the best application to be a strong solution of nitrate of silver, applied in such a manner as to cause him to consider it a wise plan to keep the patient in bed for several days after, and to wait for two or three weeks before repeating this treatment. As to membranous dysmenorrhœa, he says the treatment is "discouraging and the prognosis as to recovery with or without treatment is not good." He believes that curettage "may give temporary relief."

Seeing that a woman with a chronic muco-purulent discharge from the vagina is likely to suffer from a septic condition of the vagina, of the

cervix and of the endometrium, it is obvious that frequently repeated severe measures must be resorted to for the cure of such a condition. This, at any rate, is the opinion of a man of wide experience in the treatment of pelvic affections, and most gynæcologists of the present day will substantially endorse this verdict, where a radical cure is to be sought. I admit that considerable improvement often results from comparatively mild measures, but this is, as a rule, only temporary. The old condition sooner or later returns, and another course of treatment has to be gone through. Of course I refer to cases of long standing, and those that present themselves for treatment are, from the nature of the cases, generally so. Such reflections induced me some time ago to try the effect of ionic medication in the treatment of these cases, confining myself at first to those which had resisted all ordinary remedies. I shall not weary you with notes of all my cases—about twenty in number. These may be published in due time. Let me give you a brief record, however, of two of the septic cases, that you may have some idea as to the chronic and obstinate nature of many of them:—

Mrs. R., aged 41, was never pregnant. First attendance December 3, 1903. General health poor, stomach distress, constant sickness, muco-colitis, dysmenorrhœa, pain in left iliac region, vulva red, tender, "burning," copious thin pus in vagina and surrounding cervix; has been curetted once but with little benefit.

December 29, 1903: Uterus curetted; some improvement afterwards, but the "creamy" discharge returned three weeks after. Under treatment, local and general, continuously from September, 1904, till September, 1905. September, 1905: Curetted again; some improvement for two months after. December, 1905: Using tannic acid pessaries and vaginal douches of solution of borax for muco-purulent discharge. April, 1906: Still copious yellow discharge from vagina in spite of regular treatment. October, 1906: Evidence of left pyosalpinx, which fills and then empties itself into the uterus and vagina at regular short intervals. December, 1906: Copper ionization, vaginal and uterine, begun. April, 1907: The secretion from the vagina and cervix is apparently now normal; there is no purulent discharge; the general condition is most satisfactory; the tongue is at last clean, which I have never before seen it; the patient herself says that she is more free from pain than she has been during the past eight or nine years. May, 1907: Patient now feels quite safe to remove from Glasgow for permanent residence in the south of England; she had delayed taking this step on account of the state of her health.

Miss L. October 31, 1906: Was curetted in June last on account of purulent vaginal discharge, which had lasted for years; there is still a copious discharge of pus from the vagina. Repeated applications of liquid carbolic acid into the cervical cavity being found of only temporary benefit, ionization with copper was now commenced. December 18, 1906: Has had, in all, six applications of

ionic medication ; there is now found only a little whitish yellow deposit around the cervix ; general health has much improved ; no further treatment required, except an occasional vaginal douche of a weak solution of alum. November, 1907 : Now in almost perfect health : no douching has been required since July.

All the septic cases in which I have employed this treatment have done equally well with the exception of one. The discharge in this case had been purulent, profuse, and of long duration, and it had proved refractory to all treatment, including curettage. The micro-organism found was the *Bacillus coli*. I may state here incidentally that in none of my cases has the gonococcus been found. Ten ionic applications in all were given to this patient, and about three months after the close of the treatment Dr. John Ritchie reported to me as follows : " The discharge is less yellow, is rather, indeed, of a milky appearance ; it is probable, also, that the total amount is lessened ; it seems that at times it is absent." This I reckon as one of my two failures. With ordinary treatment I should have considered the result a modified success.

What has impressed me during the practice of ionic medication has been the rapid improvement in cases of cervicitis. The discharge, from having been muco-purulent and copious, has become milky and of small amount, whilst the gaping os has become normal in size, with the everted mucous membrane drawn in, and erosions have rapidly healed. That the general health invariably improved, coincidently with the cure of the septic condition, is only what might have been expected, and that a tongue which had been foul for years owing to autotoxæmia should become clean and remain so, without any gastric treatment, is one of the evidences of this constitutional improvement. In two of my cases this toxæmia was accountable for periodic attacks of severe gastric pain, due evidently to the effect of the toxæmia on the solar plexus. In such cases the dread of malignant disease on the part of the patient is not the least of the causes of distress. In one such case, where the pain had lasted for twelve years, this was completely removed after a few intra-uterine applications of the copper electrode. This was a year ago, and there has been practically no return of the pain since.

No case of hæmorrhage has failed to yield at once to the treatment by ionic medication, with one exception—the other failure which I have to record. This lady came under my care on May 7, 1907, complaining of menorrhagia, which had been practically continuous since her marriage seventeen years before. She had never been pregnant and had been twice curetted. The menorrhagia had been severe, and had generally

lasted from two to three weeks. I first curetted her and then applied ionic medication to the interior of the uterus. At first the result was gratifying, but later on the hæmorrhage returned for a time. The present report is: "Better than for years; able to do now what previously seemed impossible. Menstruation has been almost normal during the past three months; the last time was the best for many years." Although I am reckoning this as one of my two failures the result here also would have been looked upon as a modified success under the previous treatment. In another of the hæmorrhage cases, where long-continued treatment had been of no avail, the bleeding stopped two days after the second application of ionic medication and it has not returned. This was a year ago.

I have treated by this means one case only of membranous dysmenorrhœa. I show you the amount of membrane expelled: first, at the beginning of the treatment; second, at its close; and third, two months after cessation of treatment. At the last menstruation no membrane could be detected. This is the first occasion in which I have been able to make a satisfactory impression on a case of membranous dysmenorrhœa. Nine applications in all were given, extending over a period of seven weeks. The pain, which previously had lasted for twelve hours, has disappeared with the disappearance of the membrane. Indeed there is now less dysmenorrhœa than since marriage ten years ago.

In all my practice I had only one case of bacteriuria in women which proved intractable. This patient suffered from autotoxæmia, causing repeated attacks of gastric pain and sickness, which was often uncontrollable. For years she had been on an average three months in bed each winter from this cause. Some improvement had taken place after other sources of sepsis had been removed, such as foul teeth and septic endometritis; but no treatment by bladder injections or by general remedies had proved of any avail. Ionic medication of the interior of the bladder, extending over a period of less than three weeks, was commenced in March, 1907. In July following my notes state: "Better in health than since girlhood." The urine was still foetid, however, though less so. In April of this year the urine was found to be entirely free from odour, and it became perfectly clear on being filtered through one ply of ordinary filter paper. The general health had remained good since the last report, the past winter having been the first for years which required practically no confinement to bed.

Having satisfied myself that ionic medication was of considerable

service in obstinate cases of pelvic disease, and in order to eliminate as far as possible any *post hoc* argument, I decided to try this treatment in the general run of cases. If those previously treated by this means had benefited in spite of their obstinate character, and if the treatment was the cause of this benefit, then *a fortiori* the same treatment ought to be successful in less obstinate cases.

Before reporting my results in these milder cases let me state that about a year ago I mentioned my experience of the treatment under consideration to some of my medical friends. Two of these, namely, Dr. W. F. Somerville, of this city, and Dr. Agnes Savill, of Harley Street, have put it to the test, each in two cases where other treatment had failed, and they have both been kind enough to send me notes of these cases. Dr. Agnes Savill's report is: "The treatment which you advised me to try worked like magic. I could not have believed it, had I not seen it and done it." Dr. Somerville was equally gratified with his results.

My experience of ionic medication in the milder cases has been monotonously gratifying. I shall not trouble you with their details, but shall hasten to describe the method of application of this treatment which I have found suitable. My experience has been practically limited to the use of copper and iodine. There has been no necessity to try other agents. My friend Dr. Lewis Jones has suggested to me, however, that each micro-organism may have its own specially potent germicide—copper for one organism, zinc for another, and so on. There is likely to be something in this, but I cannot speak from experience.

My first difficulty was with electrodes. I have had some made, however, which give me every satisfaction so far as convenience goes; and this is more important to the physician and to the patient than might at first be imagined. I have had a glass speculum made which suits much better than the ordinary one, and the openings in it near to the cervical end serve to convey the fluid to the sides of the vagina, thus distending and filling it. The holder of the electrodes is kept in position by a bag of shot which rests on its broad end on the couch, the patient being on her back with a bed slipper under the pelvis. This holder, as you will observe, keeps the speculum in position, preventing it from slipping out or from dropping. Everything being therefore fixed, the cervical or intra-uterine electrode can, after insertion through the speculum, be kept in position with perfect ease and safety. A spiral of copper wire inserted into the speculum and fixed to it in the way I show you serves for vaginal applications and also for vulvar by using

it for the purpose of pressing against a pad of cotton soaked in the fluid and packed carefully against the opened vulva. The preparation of copper which I employ is the cupric chloride, the solution being 1 per cent.; and I prefer now always to insert the cervical and the intra-uterine electrodes through the speculum. This ensures asepsis and, the uterine electrode having grooves in it, the fluid can pass readily along its sides and so fill the uterine cavity. Being applied to the + pole the current must be reversed for about one-third of the time it has been allowed to flow in order to extricate the electrode; otherwise there will be pain and bleeding. In order to avoid shock the current must be started and stopped slowly and steadily. I formerly applied the neutral electrode to the hypogastrium or to the sacral region, but this involved the undressing of the patient and prevented the current from being diffused equally throughout the cavity of the uterus, since it takes the most direct course to the neutral electrode. I find the hands a convenient place for the neutral electrode—a large clay one—because, being at a distance from the uterus, the current will more readily diffuse itself over the whole of the uterine wall. All rings must be removed, however, whilst the current is flowing, otherwise the fingers may be burnt beneath the rings. No pain need follow the application when the method I now follow is adopted; but in some of my early cases considerable pain and, in two instances, some pelvic cellulitis followed. No permanent injury, however, resulted.

When the affection partakes at all of a subacute nature, or when past experience has led to the fear of cellulitis, I prefer to start with iodine as the ionic agent instead of with copper. Of course the — pole must then be the active one, and the electrode there should be a carbon one, such as I show you. There is no advantage in applying the iodine wholly in an uncombined form, because, as you will observe from one of the diagrams, it at once becomes converted into NaI when it enters the tissues. The solution I employ is a 2 per cent. one of iodide of potassium combined with 0·2 per cent. solution of liquor iodi. It is well, I find, to have the vulva and vagina fairly free from sepsis by the ionic measures before using the cervical or the intra-uterine electrodes, especially the latter. This treatment can with moderate care be rendered absolutely safe; and, with the electrodes I show you, involves no discomfort to the patient, whilst it requires little watching on the part of the physician. The current can be obtained from a battery of from fifteen to twenty Leclanché cells of good size. I prefer this, as a source of current, to that obtained by a shunt circuit taken off the electric main.

A rheostat is required to regulate the current and a galvanometer to register the quantity used. I find an average dose to be 15 ma. for from fifteen to twenty minutes. Should a larger dose be desirable, this can be obtained by placing one pad over the hypogastrium and another connected with it over the sacral region.

Let me say, in conclusion, that since I commenced to treat pelvic diseases by means of ionic medication I have treated fewer cases of septic endometritis by curettage, and I am satisfied, from a long experience of the treatment of pelvic affections, inflammatory and septic, that no other form of treatment will give results in any way approaching those to be obtained from ionic medication.

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The Council think it right to state that the Society does not hold itself in any way responsible for the statements made or the views put forward in the various papers.

Epidemiological Section.

October 25, 1907.

Dr. NEWSHOLME, President of the Section, in the Chair.

PRESIDENTIAL ADDRESS.

Poverty and Disease, as illustrated by the Course of Typhus Fever and Phthisis in Ireland.

THE occasion of this address coincides with an interesting phase in the history of the Epidemiological Society. Founded in 1850, with a first President in Dr. Babington, and such historical names amongst its Vice-Presidents as Thomas Addison, Richard Bright, Southwood Smith, and Thomas Watson, and among its Members of Council as W. B. Carpenter, W. W. Gull, W. Jenner, Edmund Parkes, J. Simon, and J. Snow, this Society during the last fifty-seven years has been the centre to which to a large extent has converged, and from which has radiated, our increasing knowledge of epidemiology. Among its past Presidents are found the names of Milroy, William Jenner, E. Seaton, J. N. Radcliffe, Joseph Fayrer, George Buchanan, and R. T. Thorne, and I deeply appreciate the honour which places my name on a list including not only such names as the above, but also those of my distinguished living predecessors.

I address you this evening as President of the Epidemiological Section of the new Royal Society of Medicine. Our Society, with two exceptions, is the oldest of the thirteen societies which so far have amalgamated; and under the new conditions we anticipate an even fuller history of interchange of facts and opinions, of records of results of and of stimulus to further research, and the appearance of annual volumes of Transactions which will be as valuable and as completely set forth as those hitherto published.

The amalgamation can be regarded by all alike as a subject for congratulation, in so far as it indicates a realisation of and a deter-

mination to promote the unity of Medicine, and an appreciation of the necessity to base its progress on etiological knowledge. Empiricism has had its triumphs in medicine. Who can deny it on recalling the history of the treatment of three of the most decimating diseases in the world's history—syphilis, malaria, and rheumatic fever? Such triumphs are, of course, rare, and the triumphs of the future, as have been those of the recent past, will doubtless in the main be the result of accurate scientific work. If the present hopeful prospect is realised, they will include many conquests due to increased knowledge of bacteriology and protozoology, and of general pathology, and to the application of this knowledge to treatment and prophylaxis.

But, side by side with the brilliant and successful micro-analysis of pathological processes which has distinguished the last quarter of a century, valuable results have already been secured and may be reasonably expected to an increased extent from the enlightened macroscopy of the community in relation to infective diseases. Although deficient coördination between the various branches of medicine has impeded the full utilisation of valuable information, much is being done to improve our knowledge of the collective aspect of disease. In particular, the sociological data for our epidemiological investigations are ampler and more accurate than ever before, and we expect by their means to improve on the results of our predecessors, who had to work on records less ample and less accurate. There is only too much room for further improvement in our records so far as they bear on disease, and it is particularly incumbent on members of this Society not to allow the admirable work by Dr. Tatham, our distinguished ex-President, and his predecessors, to make them forgetful of the disadvantages under which this work has had to be done, and the importance of helping to secure the removal of all impediments to complete and accurate records. Even with present material the epidemiological study of communities furnishes us with most valuable guidance in the administrative work of public health; and for my present address I have chosen a subject which I trust will be found to illustrate this statement.

Poverty and Disease.

Poverty and disease are allied by the closest bonds, and nothing can be simpler or more certain than the statement that the removal of poverty would effect an enormous reduction of disease. The removal of poverty must, therefore, be in itself an object always fascinating to those whose study is the public health. The diseases which would be reduced

by this means include not merely those which physicians treat, but many moral diseases which persist because they are only to be avoided by the poor through the exercise of discipline and self-restraint far beyond what is practised by the average person in classes not subject to poverty. The happiness of a community being in itself a desirable object, a national asset, it is also not irrelevant to consider that the removal of poverty involves enlarged opportunities for enjoyment, which, rightly directed, would be only of less value than the removal of disease. It is not surprising, therefore, that the first impulse of a student of the public well-being, in which the public health is the most important factor, is to attack disease by demanding the reduction of poverty, with its more or less inevitable accompaniments of over-fatigue, privation, over-crowding, and dirt. And it must be freely admitted that when the most active public health administration, including medical aid for the sick, has attained its utmost efficiency and has in every respect done all that it can to reduce disease, there will still remain a cruel residuum which can be attacked in no other way than by the removal of poverty, or by the removal from poverty of the elements of personal privation which affect the public health.

The data of epidemiology owe their chief importance to their use in relation to the practical problems of public health ; and in prophylaxis it is supremely important to know the relative value of every weapon that is available against disease. There is a limit, none the less real because it fluctuates from generation to generation, to the money and energy which are available for public health administration ; and money or energy expended without adequate return represents so much disease allowed to persist, although it might have been prevented had the available funds been spent to the best advantage.

It is to epidemiology that public health administrators look for such data as will enable them to select, from the multitudinous measures open to them, those which will yield the best return ; and the science is, I think, well occupied when it is investigating not only the efficient causes of a disease, but also, in such rough measure as is possible, the manner and the extent in which each of these causes operates.

The relation of poverty to disease is eminently a problem which deserves to be studied with this object. In this address I propose to speak first on the manner in which poverty assists the spread of some infectious diseases, as illustrated by typhus in Ireland, in order to exhibit roughly the extent to which epidemics have been due to the migrations of patients and their relatives, determined by exacerbations of poverty.

In such an enquiry it is very far from my intention to imply that the privations of poverty have not, apart from such migrations, played a material part in the conveyance of infection. Such privations, I am firmly persuaded, have facilitated not only the spread of infection, but also, and probably in much greater measure, the fatality of the disease. The conditions of poverty in a community exposed to typhus, as to phthisis, may be compared with the dryness of timber exposed to the onset of fire. The poorer and the more over-crowded the population, the drier and the more densely aggregated the timber, the more extensive will be the epidemic or the conflagration produced by infection or flame. Similarly with regard to preventive measures : in a community free from fever or from fire, a most important preventive measure obviously would be to increase the resisting power of the community to infection, of its buildings to fire ; though at the same time vigorous measures would be taken to prevent the access of infection or sparks. But when the community is infected or fires are burning in the vicinity of the desiccated timber the choice of measures is more restricted ; for reduction of susceptibility can seldom be improvised at short notice, as it can in the exceptional instance of small-pox. To fireproof the timber of a wooden building is usually less practicable than to stop the access of fire to it. Under these circumstances the most essential line of action is to isolate the infection or the fire, so that it may not spread to other patients or buildings which, however deplorably susceptible, have as yet not actually been attacked. This line of action cannot reduce the excessive liability of a poverty-stricken community either to attack by, or to a fatal issue of attack by, fever, nor obviate entirely the accidents by which infection will from time to time, in spite of all precautions, gain access to a susceptible community. So long as the poverty-derived condition of diminished resistance to infection exists, so long will enhanced toll be levied by an invading disease. Except on paper, no measures for controlling the spread of a disease can give absolute protection against invasion, and the suffering will be greater when the susceptibility of the invaded population has been increased by privation and over-crowding.

It is conceivable that as our measures against the invasion of infection become perfected, through our increasing knowledge of epidemiology, and they become universally applied, the ease with which, owing to lowered resistance, disease traverses a community may eventually be the chief or even the sole objective of preventive medicine. It has to be admitted, however, that we have not hitherto perfected our measures for preventing invasion by infectious disease, and that, apart

from measures for increasing resistance to invasion, we have still much to learn as to the laws of epidemicity.

My present purpose is to give certain historical facts which, without furnishing a rigid demonstration, seem to me to indicate that the main factor in suppressing typhus has been the occurrence of circumstances, or the more or less unintentional adoption of means, tending to immobilise infection in invaded districts, and to prevent its travel by means of ambulatory cases. The practical effect of this view is to emphasise the special importance to be attached to administrative measures for the immobilisation of the infection of typhus and of other diseases which appear to have similar methods of travel.

It is with no disparagement of the value of means for diminishing susceptibility by removing privation and over-crowding that I seek now to celebrate the triumphs secured by administrative measures against the vagrancy of invaded populations and the associated travel of disease. I have myself on various occasions drawn attention to the effect of over-crowding and of privation on the health of the community; and further experience and study of the subject have confirmed me in my sense of the importance of these factors of the public health. I am, moreover, increasingly sensible of the slowness with which improvements in these respects can be expected, and, like all my colleagues in the public health service, have had repeated experiences of occasions when the benefits of improved nutrition and housing have been wasted because the population has not been protected from periodical avalanches of infective disease. Hence, while waiting for economic improvement to reduce further the privations of poverty, the lesson which I am wishful here and now to impress upon myself and others is the power of public health measures to decrease its amount.

Typhus in Ireland.

The greatest prevalence of typhus in Ireland occurred before separate statistics of this disease became available in 1869. The history of famine and of typhus in Ireland is closely wrapped up with that of the potato, introduced in 1610. Even in the early part of the reign of Charles II. this "deimoralising esculent," according to Petty, was already the national food. It was thus described because the life of large families could be supported by its means with little labour, so that the subsistence of the population was thus placed at the mercy of a single crop.

Between 1788 and 1831 the population of Ireland increased from

3,900,000 to 7,767,401. The potato and the small amount of land needed for its cultivation made this possible. The rate of wages was kept down by the same conditions; and Malthus¹ speculates with much force on how different would have been the history of Ireland had the staple food of its population been oatmeal or wheat.

An extreme subdivision of the land occurred during the eighteenth and early part of the nineteenth century, and the potato enabled the cottiers to live under the evil conditions thus initiated. During this time, and especially throughout the Napoleonic wars, Ireland was the granary of England, and the prosperity of the landlords led them gladly to subdivide their farms, their tenants further sub-letting to the cottiers. The continuing subdivision of the land into potato gardens tended "slowly but inevitably to that worst form of civil convulsions—a war for the means of subsistence,"² and verified William Cobbett's prophecy that "the dirty root will be the curse of Ireland."

The absolute dependence of the Irish agricultural population on the potato was increased by the fact that there was no such overflow of population to urban districts as England enjoyed.

Bryce, in the introduction to "Two Centuries of Irish History, 1691-1870," says:—

It was among the Ascendancy party that resistance to England began. They saw Irish manufactures destroyed for the sake of English manufactures; heavy duties laid on Irish exports to England; Irish revenues jobbed away in providing places or pensions for favourites too disreputable even for the corrupt England of that day. England did nothing for Ireland, and suffered her to do nothing for herself. (P. xx.)

The immediate effect of famine was widespread migration of population, and vagrancy. Thus Creighton³ says:—

It was the enormous swarms of people begging at a distance from their own parishes that spread the infection of fever; and there appears to have been as much of beggary in 1741, when Ireland was under-populated with two millions, as in 1817-18, when it was over-populated with six millions.

Want and fever were endemic, with frequent exacerbations, in the eighteenth century. During the Napoleonic wars, 1803-1815, fever was less prevalent, a factitious prosperity being secured by the high prices then prevailing. With the end of these wars crowding, poverty, and mendicancy increased, typhus with them. In 1817 these conditions

¹ Malthus, on "Population," book iv., chap. xi.

² "On Local Disturbances in Ireland," by Sir Geo. Cornwall Lewis, p. 338.

³ Creighton: "A History of Epidemics in Britain," vol. ii., p. 244.

culminated in famine, and in the spring of this year "the whole country appeared to be in motion."

J. H. Bridges,¹ referring to this epidemic, says:—

Hordes of starving families were driven from their homesteads into the garrets and cellars of the nearest town; when hope of finding work was gone, and town after town had been visited in vain, they betook themselves to a life of aimless vagabondage, living on wild turnips and nettles when alms failed, and carrying death with them. . . . The most potent causes, vagrancy, starvation, cold, and above all the moral lethargy and despondency resulting from enforced idleness, . . . were for the statesman rather than for the physician to cure.

There was no poor-law provision in Ireland until 1838, and its absence was largely responsible for the wide wanderings of the starving people. This distressful country was in fact very much in the same condition as England in the reign of Elizabeth, before poor-laws were enacted. The hospitable nature of the Irish caused rapid extension of typhus in this and the next two years,² as did also the observance of wakes, the distribution of soup at centres, and the ordinary annual migration of agricultural labourers from one part of the country to another, and over to England and Scotland for haymaking and harvesting. Over 100,000 cases of fever are known to have passed through the hospitals during this epidemic, and the total number of cases was variously estimated at from 400,000 to 1,500,000. It is noteworthy that certain isolated parts of Ireland, although suffering severely from famine, escaped infection;³ and in this respect the analogous escape of the inhabitants of lighthouses, &c., from influenza, as recorded by Parsons, is significant. The teaching of these instances of exceptional freedom from infection when there was no spread of infection by the wanderings and mendicancy of the people was, however, almost entirely lost. Thus we find the then Chief Secretary of Ireland in 1819 expressing a hope "that the lower Irish would be better prepared in future to guard against such a calamity; that they would be more cleanly in their persons and

¹ J. H. Bridges, in "Two Centuries of Irish History, 1691-1870," part iii., p. 265.

² Thus, Peel said in the House of Commons, April 22, 1818: "It was lamentable, at least it was affecting, that this contagion should have arisen from the open character and feeling of hospitality for which the Irish character is so remarkable."

³ Creighton, *op. cit.*, vol. ii., p. 262, gives the following instances: "The island of Rathlin, seven miles to the west of Antrim, which was as famished as the mainland, had no typhus at the time when it was epidemic along the nearest shore. The island of Cape Clear, at the southernmost point of Ireland, had a similar experience. The whole county of Wexford, where the soil was dry and the harvest of 1816 had been fair, kept free from typhus until 1818, partly because it was out of the way of vagrants."

domestic habits, fumigate their houses, and change their bedding and clothes." Excellent advice in its way, but failing in recognition of the most urgent and governing conditions of the problem. In this, as in previous epidemics, although the infectiousness of typhus and its liability to be conveyed by migrants were recognised, no efficient steps were taken to immobilise the infection, with the result that patients and their relatives dragged their fever-tainted persons and clothes to remote districts.

The need for fever hospitals and for poor-law provision was further emphasised by the famine of 1822, which "mowed down the inhabitants like hay," and by recurring years of scarcity and fever on a smaller scale in other years. Finally the Act of 1838¹ was passed. This Act, unlike the English Act, entirely prohibited outdoor relief, and there was no law of settlement. Each union was divided into electoral districts, each chargeable with its own poor. Before the end of 1840, 127 unions were formed, each with its own workhouses, and the total 130 arranged for in the Act were soon afterwards established. Relief could not be obtained except in these workhouses, and although some diminution of suffering must have been caused by them, the unwillingness of the Irish to enter them left vagrancy rampant, though probably less so than before their establishment.

The Great Potato Famine of 1847.

The great failure of the potato crop brought into further relief the urgent need for reforms. By evicting their tenants landlords had evaded chargeability for them under the poor law when they became destitute, with the result that the outcasts flocked into the towns, and soon were thrown on their rates. In 1845 the potato crop failed partially, and in 1846 and 1847 completely. The blight to which this failure was due had been seen in Belgium in 1842, in Canada in 1844, and in England in August 1845. Alarm concerning it was felt in September of the same year in Ireland, and in fact from one-third to one-half of the total yield in that year failed. The Irish corn harvest of 1845 was abundant, rents being paid in corn, oatmeal, and butter, while the people were suffering the beginnings of starvation. The total failure of the potato crop in 1846 completed the national calamity. Epidemic disease prevailed in 1846-7, largely typhus—but along with it relapsing fever, dysentery, scurvy and purpura—and the total cases of

¹ An Act for the more effective Relief of the Destitute Poor in Ireland (1 and 2 Vict., c. 56, July 31, 1838).

sickness were estimated at over a million, or about one-seventh of the total population. The population of Ireland in 1845 was over eight millions, of which it was calculated that one-half were dependent on the potato for subsistence.¹ Its population before and after this period is shown in the following table:—

CENSUS POPULATIONS.

Years of increasing population	Percentage increase in the decade	Years of decreasing population	Percentage decrease in the decade
1801 ... 5,395,456	—	1851 ... 6,552,385	19·8
1811 ... 5,937,856	11·0	1861 ... 5,798,967	11·5
1821 ... 6,801,827	11·5	1871 ... 5,412,377	6·7
1831 ... 7,767,401	11·4	1881 ... 5,174,836	4·4
1841 ... 8,175,124	5·2	1891 ... 4,704,750	9·1
		1901 ... 4,458,775	5·2

From 1846 to 1851 it was calculated that the emigrants from Ireland numbered 1,240,737. This emigration was in the main subsequent to the great famine. During its course relief works were organised on a scale the magnitude of which is indicated by the following figures:—

In Oct., 1846, the average number employed on Relief Works in Ireland was	... 114,000
„ Nov. „ „ „ „ „	... 285,000
„ Dec. „ „ „ „ „	... 440,000
„ Jan., 1847 „ „ „ „ „	... 570,000
„ Feb. „ „ „ „ „	... 708,000
„ Mar. „ „ „ „ „	... 734,000

In the last-named month it was estimated that 240,000 had already perished of destitution. Under the schemes of the Relief Committees that were organised, three million persons at one time were receiving daily rations. During all this time a fleet of ships left the shores of Ireland almost daily laden with corn, “so that the Irish people . . . perished of hunger in the granary of England.”

Some reference has already been made to the efforts made by the Government to cope with this great calamity. In addition to the purchase of maize and its free distribution in Ireland, three Acts were passed in 1846-7 which made some attempt at dealing with vagrancy, compelled the appointment of medical and relieving officers, made owners of land liable to contribute to the poor-rate, authorised the granting of outdoor relief to the permanently infirm poor, and to the able-bodied when the workhouse was full, but only on the recommenda-

¹ In 1839 Thomas Carlyle wrote in “Chartism”: “Ireland has near seven millions of working people, the third unit of whom, it appears by statistic science, has not for thirty weeks each year as many third-rate potatoes as will suffice him. It is a fact perhaps the most eloquent that was ever written down in any language at any period of the world’s history.”

tion of the Poor Law Commissioners, and as a temporary relaxation, accompanied by a rigid labour test. Occupiers of more than a quarter of an acre of land were not entitled to relief; and this enactment "forced the Irish cottiers in masses from the soil," with much immediate suffering, in order to qualify for relief. "Had the Act of 1847 been purposely framed for the weeding out of the Irish cottiers, it could not have been more effectual,"¹ and a silent exodus occurred; famine and the poor-law provisions produced widespread abandonment of holdings and wholesale emigration.

Migration from Ireland.

In 1848 an Act was passed to check the clearances of cottiers, compelling owners to give forty-eight hours' notice to Boards of Guardians, so that shelter for the evicted could be provided in the workhouses; and in 1862 an amending Poor Law Act was passed, modifying the "quarter-acre clause" except so far as outdoor relief was concerned. In the three years ending March 1849, 160,000 persons had been ejected from their holdings of all sizes;² between 1849 and 1860, 373,000 families were evicted.³ Landlords suffered with their tenants, the poor's taxes taking all the rent; and it is stated that one-sixth of Ireland changed hands. In 1841 there were 698,549 agricultural holdings in Ireland under fifteen acres; in 1851 the number had been reduced to 317,665. Further details are shown in the following table. It will be observed that the change was nearly complete in 1851.

NUMBER OF SMALL HOLDINGS IN IRELAND.

	One acre and under	One to five acres	Five to fifteen acres	Over fifteen acres
1841	135,314	310,436	252,799	127,967
1851	37,728	88,083	191,854	290,401
1861	41,561	85,469	183,931	299,084
1871	48,448	74,809	171,383	297,952
1881	16,879	61,751	147,823	272,656
1891	18,243	55,554	139,195	273,873
1901	29,037	52,388	134,188	274,688

According to official statistics, the number of emigrants from Ireland in

1831-41 was	214,047	1861-71 was	768,859
1841-46 „	272,829	1871-81 „	618,650
1846-51 „	1,240,737	1881-91 „	768,105
1851-61 „	1,149,118	1891-1901 „	430,993

¹ J. H. Bridges, *loc. cit.*, p. 425.

² G. L. Lampson, "A Consideration of the State of Ireland in the 19th Century, 1907," p. 283

³ Mulhall, "Dictionary of Statistics," p. 175.

The exact ratio of emigration to population in successive years from 1842 to 1904 is shown in fig. 1, and it is interesting to compare, so far as the statistical records extend, the coincidences between years of excessive emigration and of excessive typhus, as shown in fig. 2.

Seasonal Migration from Ireland.

The migration hitherto mentioned was almost solely to the United States. It was doubtless a temporary cause of increase of typhus both at such ports as Bristol and Liverpool and in the States, though to

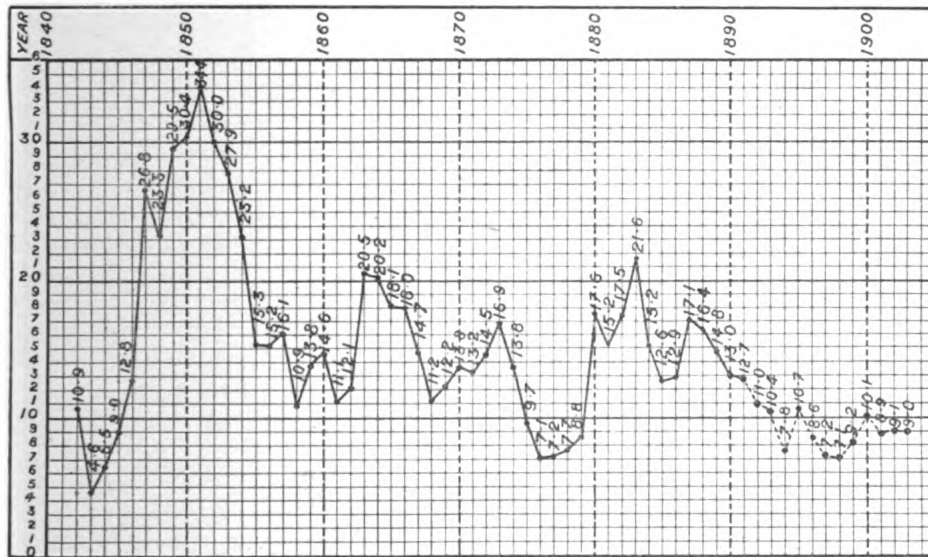


FIG. 1.

Annual Rate of Emigration from Ireland, per 1,000 of Population.

a less extent than the annual migratory movements of agricultural labourers. Records of disease in England and Scotland show frequent coincidences between the movements of emigrants and outbreaks of typhus in the districts visited by them. Graves, of Dublin, in 1843 wrote:—¹

It is curious that in those towns in England which have greatest intercourse with Ireland, as Liverpool, Manchester, Bristol, typhus predominates more than in others not similarly circumstanced.

¹ Graves's "Clinical Medicine," 1843, p. 47.

He does not, however, regard this as evidence of importation, but expresses his opinion thus:—

It appears that, as regards Scotland, this explanation is anything but satisfactory, and it seems more probable that the rest of England, Scotland, and Ireland, in which the climate is almost the same, possessed almost the same combination of circumstances which produce typhus.

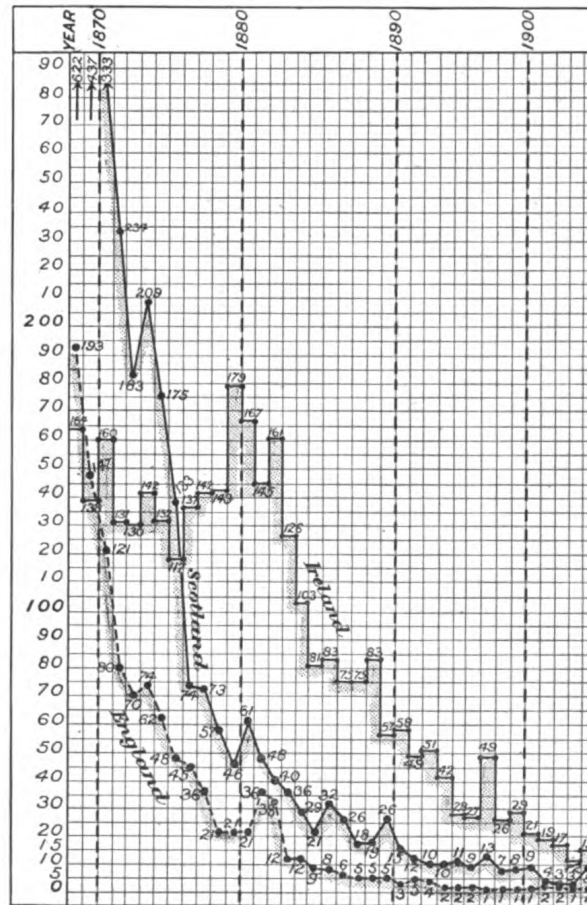


FIG. 2.

Annual Death-rates from Typhus Fever in England, Scotland and Ireland, per 100,000 of Population since the deaths from this disease were first tabulated separately in the official reports.

Migration to the United States was not, however, so permanently dangerous as the inter-migration between different parts of Ireland and between Ireland and Scotland and England, which annually occurred

at times of hay-making, potato digging, and harvesting. This was an annual phenomenon of old standing, Lecky describing the condition in the eighteenth century, which still prevailed more or less during the first half of the nineteenth century, in the following words:—¹

It was still true that, at the beginning of every autumn, the roads were crowded with barefooted and half-naked mountaineers, who were travelling on foot 150 or 200 miles, to work for the harvest in England, where they commonly fell into the hands of contractors known as "spalpeen brokers," who distributed them among the farmers, intercepted a substantial part of their scanty wages, and imposed on them an amount of labour which few West Indian planters would have extracted from their negroes. It was still true that it was a common thing for large farmers, whose lands included barren mountain tracts, to place cottiers on their lands in order to reclaim them, and to turn them adrift as soon as by hard labour they had made them productive. It was still true that cottiers were often obliged to work out the extravagant rents that were charged for their potato plots, at the rate of fourpence or fivepence per day; that their sole food, in many districts, was potatoes mixed with the milk that remained when the butter had been made; that during part of the year they were often reduced to potatoes and water; and that even potatoes could not always be counted on.

Some light is thrown on the extent of migration between Great Britain and Ireland by the fact, noted by Mackay,² that in 1841-48 the difficulty in controlling vagrancy in England was greatly increased by migration from Ireland. In the year ending March 25, 1848, 15,571 persons were removed under the powers of the Poor Law Acts from England to Scotland, Ireland, and the Isle of Man, and of these 15,020 were Irish. A large number of the latter were returned by the next boat after arrival.

Between December 1, 1846, and April 29, 1847, 150,000 persons landed from Ireland in the one port of Liverpool, and it is noteworthy that, following on the great epidemic of typhus in Ireland in 1845-47, 56,000 more persons died from "fever" in England and Wales than on an average in each of the five previous years.

Mr. A. Wilson Fox, in his report as Sub-Commissioner to the Royal Commission on Labour, 1893, says:—

The number of migrating labourers has been steadily decreasing for a number of years, which is due to the decrease of tillage in England and Scotland, and to the use of machinery. In Cumberland the adoption of machinery has entirely done away with the employment of Irishmen at harvest.

¹ Lecky, W. E. H.: "A History of Ireland in the 18th Century," vol. iii., chap. viii., pp. 412-414.

² "History of the English Poor Law," vol. iii., p. 376.

He also quotes the Registrar-General, who stated in his evidence before the Royal Commission on the Land Acts (Ireland) 1886:—

In 1841 this migration was common almost all over Ireland, but it is now confined almost to Connaught and Donegal: in 1841 the migratory labourers were 58,000; in 1884, 14,000; in 1885, 13,000; in 1886, 12,000. Of these, 10,000 were from Connaught, 7,000 from Mayo alone.

Vagrancy and Mendicancy in Ireland after 1847.

The Act of 1847¹ enacted that persons wandering abroad or begging in public places, or going from one Union to another, for the purpose of obtaining relief, should be sent to hard labour. In 1856 it is noted in the 9th Annual Report of the Poor Law Commissioners in Ireland that during the last three years there had been a steady diminution of mendicancy; and this fits in with the diminished emigration during these years following the great exodus by death and emigration. The exact course of vagrancy, apart from the indications furnished by good and bad seasons, by emigration, and by seasonal migration, is difficult to follow in later years, but all the facts point to the conclusion that vagrancy increased or decreased according as agriculture was temporarily embarrassed or successful.

The Repeal of the Corn Laws and its Effects.

It has been truly said that the rainy seasons accompanying the blight and the potato famine of 1845-47 washed the corn laws out of the statute book.² At the head of his reconstituted ministry, in 1846, Peel proposed and carried the repeal of these laws. Although the removal of impediments to cheap bread must have had some beneficial result, its immediate benefits were limited, as the Irish in Ireland had no money. The whole effect of unrestricted importation of corn in widening the English market did not fully appear until about 1880, when the vast fields of America and Eastern Europe became more generally cultivated, and improved means of communication made the larger supply of corn available and cheaper. It is convenient to follow these changes a little further. Gradually, in the interval from 1849 to 1880, pasture land

¹ 10 and 11 Vict., c. 84, July 22, 1847.

² A letter, dated August 15, 1845, from Sir Jas. Graham to Sir Robt. Peel, bears on this point ("Life and Letters of Sir Jas. Graham," vol. ii., p. 21): "The sun at last is shining brilliantly and the evening looks well. I know not that the state of affairs is exactly sound when Ministers are driven to study the barometer with so much anxiety. . . . The question always returns, What is the legislation which most aggravates or mitigates this dispensation of Providence?"

replaced corn-growing. This is shown by Dr. Grimshaw's figures,¹ from which the following table has been extracted. The increase in pasturage is the most marked feature, it is stated, in proportion to the decreasing population. This decreasing agricultural population was the natural result, as in England, of the replacement of small holdings by large grazing farms, and cannot be taken as an indication of inferiority or decadence among the remaining population. (See also p. 29.)

AVERAGE ACREAGE PER PERSON UNDER THE SEVERAL DISTRIBUTIONS OF LAND, OMITTING THE SMALL AMOUNT UNDER FLAX, WOODS, FALLOW AND BOG.

	1851-55	1856-60	1861-65	1866-70	1871-75	1876-80	1881-85	1886-90
Cereal Crops ...	·47	·46	·42	·40	·37	·35	·33	·32
Green Crops ...	·23	·27	·26	·27	·27	·25	·25	·26
Meadow and Clover	·20	·24	·28	·31	·35	·36	·39	·45
Grass ...	1·49	1·60	1·70	1·83	1·94	1·95	2·03	2·09

The potato famine of 1845-48 was a turning point in the history of Ireland. Reasons will be given later (p. 22) for the conclusion that, although the population of Ireland has steadily declined since that disastrous period, "the well-being of the people has steadily increased."² It is not merely a case of *ubi solitudinem faciunt, pacem appellant*. While it is true that in agricultural districts cattle and sheep have largely replaced men, women and children, this is true also of England, and in the absence among farmers of co-operative production and sale of products it was the natural result of the new economic conditions. The keeping of cottiers on their small allotments, under the pre-famine conditions, was undesirable from every standpoint. The circumstances of their steady and continuous ejection present features which no Englishman can recall without mental discomfort. But the facts remain, that apart from compulsory ejections, similar changes in agricultural conditions were occurring in both England and Ireland, due to the same social changes, but that in England these changes were associated with the enormous development of manufactures and a vast increase of national wealth, including population; while in Ireland, owing to the sparseness of such manufactures, the same changes led to the transfer of the wealth of population to the United States.

As already stated, the effect on the price of corn of its free importation only became felt to the full extent some twenty years after the great

¹ Appendix to vol ii. of the "Report of the Royal Commission on Financial Relations between Great Britain and Ireland," p. 447.

² Creighton, *op. cit.*, vol ii., p. 295.

famine. The same holds true for the competition in providing Great Britain with meat. Fortunes were made up to 1874 by the price of cattle; after 1875, owing to American competition, prices began to fall. Even up to 1877 Ireland enjoyed, with a few exceptions, years of plenty and high prices. The two bad crops of 1877 and 1878 were then followed by the famine of 1879-80. Then ensued the usual course of events—bad crops, inability to pay rent, ejectments. Dr. Grimshaw¹ gives the following figures, the value of potatoes in each year being calculated at £3 a ton:—

Year 1876—	potato crop valued at	£12,464,300	being	4,154,784	tons.
" 1877	"	"	5,271,822	"	1,757,274
" 1878	"	"	7,579,512	"	2,526,504
" 1879	"	"	3,341,028	"	1,113,676

The difference between 1876 and 1879 was more than three-fourths of the entire agricultural rents of Ireland. Similarly, the general crops in the same four years were valued at 36, 28, 32 and 22 millions sterling respectively. The effect in respect of the actual number of ejectments is shown in Dr. Grimshaw's tables as follows:—

EJECTMENT SUMMONSES.					
			Average annual number in the 25 years, 1853-78	Year 1880	
Ulster	...	...	1,489	...	2,846
Connaught	...	...	960	...	1,995
Munster	...	...	1,076	...	2,345
Leinster	...	...	912	...	1,363
			4,437	...	8,549

In the whole of Ireland the increase in the number of families recorded as having been actually evicted is shown by the following table:—

NUMBER OF FAMILIES EVICTED IN IRELAND.						
1869	...	...	...	...	...	374
1877	...	...	...	...	...	463
1878	...	...	...	...	...	980
1879	...	...	...	...	...	1,238
1880	...	...	...	...	...	2,110

"Just as, following the famine years, ejectments multiplied, and threats of ejectments, so it was in 1879, 1880, 1881 and 1882."² Collecting rent by this method of ejectment summonses meant not only immediate misery, but the dissemination of disease by the scattered tenants. The result is seen in the typhus curve (fig. 2.). A great increase in the typhus death-rate occurred in the years 1880-83.

The curve for Dublin shows the oscillations of typhus more markedly than the smoothed-out curve for Ireland as a whole. It also shows a much higher death-rate from typhus than Ireland as a whole.

¹ Grimshaw, *loc. cit.*

² Sir Chas. Russell, quoted by L. G. Lampson, *op. cit.*, appendix, p. 619.

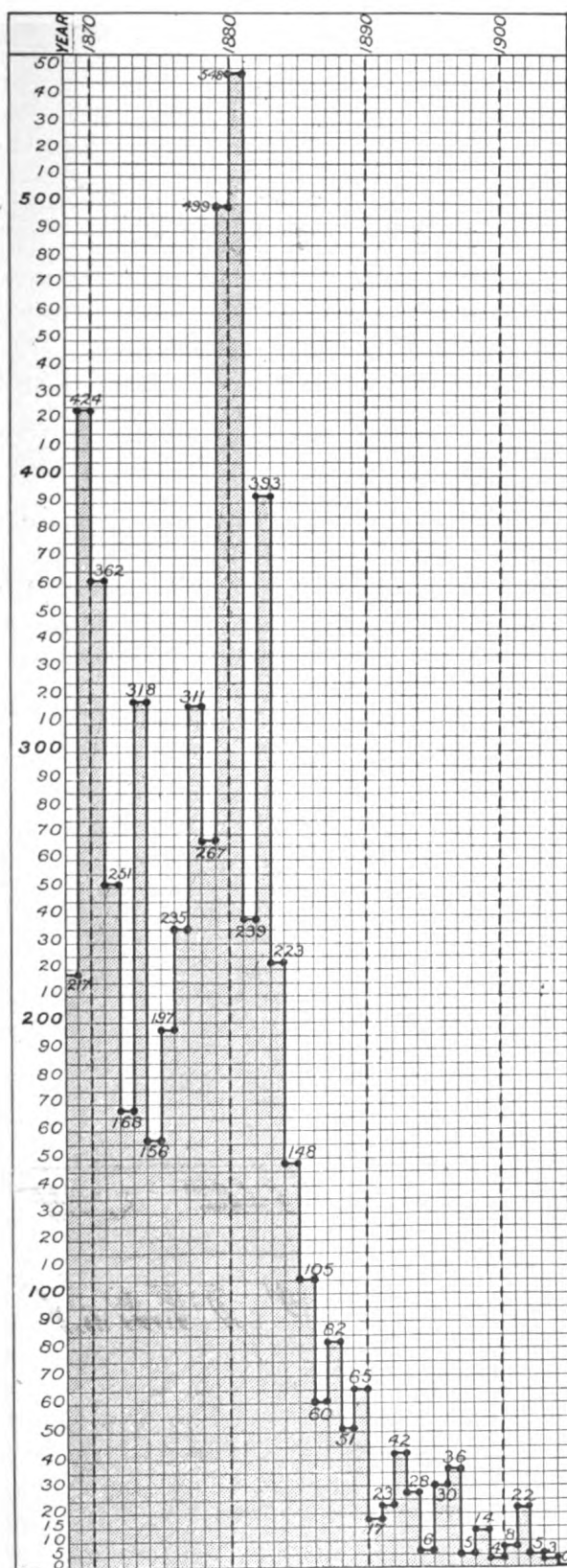


FIG. 3.

Annual Death-rate per 100,000 living from Typhus in Dublin, from 1869 to 1905.¹

For the figures relating to typhus and phthisis in Ireland as a whole and in Dublin for a long series of years, I am indebted to Dr. Matheson, the Registrar-General of Ireland.

Poor Law Administration in Ireland.

Appalling as were the sufferings of the Irish in the great famine, they would have been even worse but for the accommodation provided in the 130 workhouses of Ireland (p. 8). Although most of them, during the recurring epidemics of fever, and particularly in the great epidemic of 1847, became over-crowded pest-houses, the spread of infection thus caused was probably on a smaller scale than if the patients had been left in their hovels or by the roadside.

The Special Commissioners (Dr. Lyon Playfair and Professor Lindley) sent by the British Government to investigate and report on the potato-blight and famine, in their report dated January 20, 1846, said:—

The poor-houses will without doubt be found a most valuable means of relief, and we consider it a most providential circumstance that such an extensive resource is available against a calamity more widely extended, and more serious in its nature, than any that has affected the Irish people since the year 1817.

The number relieved out of the poor-rates at one time reached 800,000, and the workhouses and 207 temporary fever hospitals that were built received 279,723 patients in the two years 1847-48. The emigrants in 1849 numbered 214,425. Fig. 1 gives some indication in emigration of the clearances of small holdings effected after the famine. Had there been no poor-law provision the suffering would have been even greater during these five years of rapid clearance of small holdings. The restrictions as to the giving of outdoor relief were temporarily relaxed during the great famine, a circumstance which filled the landlords with alarm. In many instances owner and occupier sank in a common ruin. In other instances estates were cleared to avoid the charges. After the famine the rigid conditions as to out-relief were re-imposed, but as shown by fig. 4, in which the amount of indoor, outdoor, and total pauperism in Ireland in the years 1852 to 1906 is shown, outdoor relief steadily became more general, and from 1880 onwards the policy of the poor-law authorities of Ireland was to a large extent inverted. It cannot be said exactly what proportion of the total typhus patients were treated in the fever hospitals and infirmaries, but the proportion was high and became higher as time went on. Objections to institutional treatment were not so great in an acute febrile disease like typhus, presenting alarming symptoms, as in a chronic disease like phthisis; in which, as I have shown elsewhere,¹

¹ *Journal of Hygiene*, Vol. vi., July, 1906, p. 304.

institutional treatment was exceptional, relatively short in duration, and under unsatisfactory conditions. Quite apart from the institutional treatment of the sick, the poor-law provisions steadily restrained the wanderings of convalescent patients and of their relatives, and the

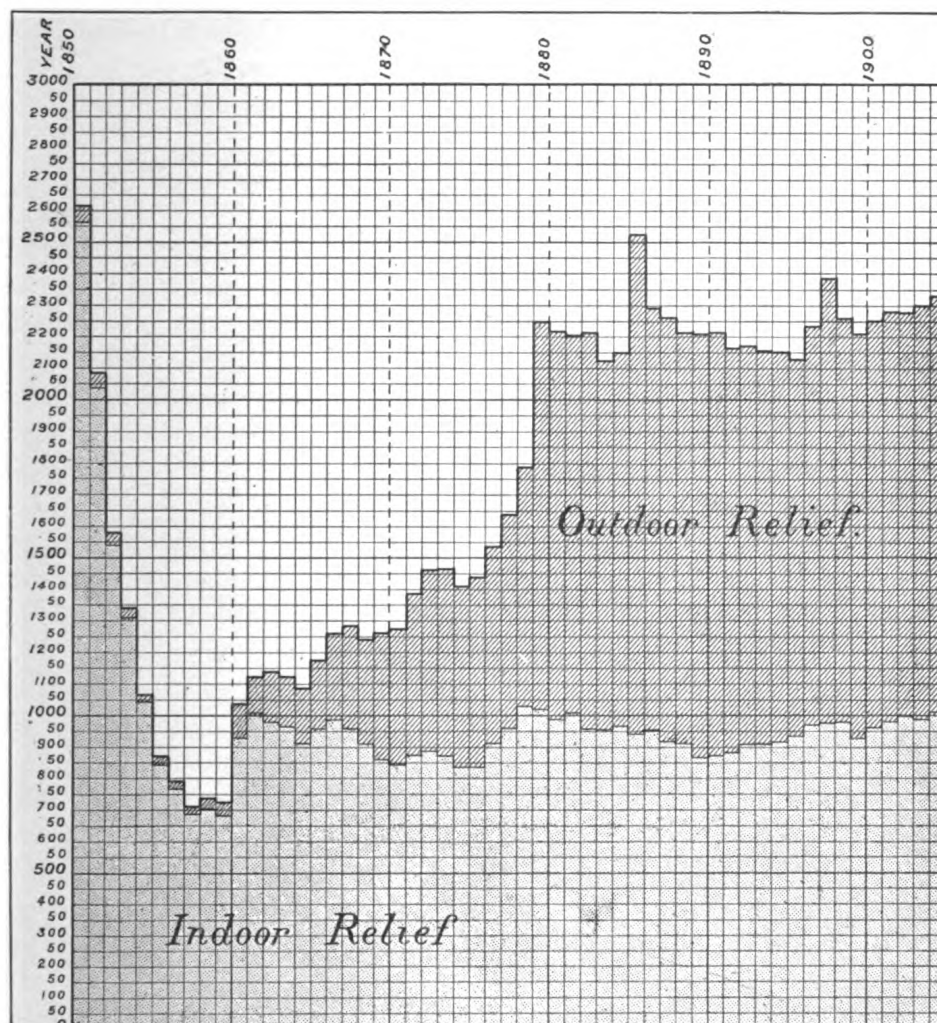


FIG. 4.

Daily Average Number per 100,000 living in receipt of Poor Relief in Ireland in each year, from the years 1851-2 to 1905-6. From returns kindly supplied by H. Courtenay, Esq., of the Local Government Board of Ireland. — (For data see p. 42.)

epidemic of 1880-83, was not only on a much smaller scale than former epidemics, but was also the last serious epidemic of typhus in Ireland. The disease still smoulders, especially in its towns, and the curve for

Dublin (fig. 3) shows occasional epidemics on a smaller scale than formerly, which are less recognisable in the smoothed-out curve for the whole of Ireland (fig. 2). The general trend, however, has been one of steady improvement, and a glance at fig. 2, shows that although Ireland has lagged behind England and Scotland, and still has some arrears to make up, the condition of the United Kingdom in respect of typhus is rapidly approaching a condition equally satisfactory in all its three countries.

Contrast between Typhus Fever and Phthisis in Ireland.

The study of typhus in Ireland has shown us that this country has suffered more severely than Great Britain, and that the great decline in the death-toll from this disease which characterises each part of the United Kingdom has been belated in Ireland, and even now is less than that in England and Scotland. This decline has been associated in each part of the United Kingdom with elevation of the standard of well-being,¹ diminution of over-crowding, improvement of conditions of housing, and increased enforcement of regulations and provisions preventing the spread of infection. It has been impracticable for me to compare the separate operation and effects on typhus of each of these factors in different countries, in which they are operating in different combinations and to a varying extent, as I was able to do in the case of phthisis in an investigation the results of which were laid before this Society last year.¹ I cannot, therefore, apportion exactly the relative share of each of these factors in producing the favourable result, though there can, I think, be no hesitation in placing means for immobilising infection in the first place. In this respect typhus must take its place beside small-pox, with the difference that in the latter disease we have the means of rendering the population immune against the invading disease. The immobilisation of infection, as we have seen, has been secured in part by the segregation of patients in fever wards, and in part by removing the inducements to vagrancy.

Although it is impracticable, when considering typhus, to state separately and more exactly the precise share of each factor in producing the reduction in its amount, we have in our comparative

¹ The separable elements under this heading are detailed in my paper on "The Relative Importance of the Constituent Factors involved in the Control of Pulmonary Tuberculosis," *Trans. Epidem. Soc.*, 1905, p. 31, and more exactly in "An Enquiry into the Principal Causes of the Reduction in the Death-rate from Phthisis during the last 40 Years, with Special Reference to the Segregation of Phthisical Patients in General Institutions," *Journal of Hygiene*, vol. vi., July, 1906, p. 328.



experience of phthisis what approaches the character of a check experiment. This will be evident when the death-rates for a long series of years from typhus and phthisis are compared. In the accompanying figures (figs. 5 and 6) such rates are set forth for each disease as percentage deviations from the average death-rate for the whole period under comparison. In order that a correct interpretation may be given to these figures, the following limiting and mean death-rates for the period under consideration must be borne in mind :—

Death-rates per million		Typhus	Phthisis
Ireland	Maximum	179 in 1880	2,260 in 1900
	Minimum	12 in 1905	1,780 in 1874
	Mean	90 in 1869-1905	2,060 in 1869-1905
Dublin	Maximum	548 in 1881	3,670 in 1883
	Minimum	0 in 1905	2,740 in 1874
	Mean	150 in 1869-1905	3,230 in 1869-1905
England and Wales	Maximum	193 in 1869	2,530 in 1870
	Minimum	1 in 1905	1,140 in 1905
	Mean	30 in 1869-1905	1,806 in 1869-1905
London	Maximum	225 in 1869	2,770 in 1869
	Minimum	0 in 1905	1,440 in 1905
	Mean	28 in 1869-1905	2,120 in 1869-1905

In fig. 2, the death-rates from typhus in England, Scotland and Ireland have been already given. On inspecting these diagrams, it is at once clear that in England (and, it may be added, in Scotland) the phthisis and typhus curves have moved in the same direction, and that both diseases show great decreases. As might be expected from the short-lived infectivity in typhus, and the protracted but much less active infectivity in phthisis, the latter is much more remote from the extinction-point than the former.

Now, if improvement in general well-being of the population, associated with better nutrition, diminished over-crowding, and improved housing, has, as is commonly stated, been the main determining cause of the diminished mortality from typhus and from phthisis in England and in Scotland, how has the equally striking diminution of typhus in Ireland been brought about, and why has it not only not been accompanied by any diminution in the death-rate from phthisis, but by an actual increase in the death-rate from this disease ?¹

¹ I have left out of the discussion the question of the trustworthiness of the national statistical returns for phthisis. This may be safely done for the following reason. There is strong cause for believing that in England, and probably also in Ireland, in the earlier years of registration of deaths, many diseases accompanied by cough and wasting were returned as consumption which were not really so. This may account for a—in my opinion—small

The same causes cannot in two countries have produced, so far as phthisis is concerned, opposite results; and as the same results have not appeared in the two countries it becomes necessary to review the conventional list of causes, and to enquire whether any counteracting influences have prevented their results from emerging. Thus either social well-being, has or has not improved in Ireland. If it has not, the decline of typhus cannot be ascribed in any measure to it. Other important factors must have been at work. If Ireland has improved in well-being, the non-decline and increase of phthisis must be due to causes which are more weighty in increasing its fatal prevalence than improved well-being is in tending to reduce it.

In attempting to explain this puzzling discrepancy, certain points need preliminary discussion. These relate (*a*) to the changes in the social and sanitary conditions of the population of Ireland; (*b*) to the question as to whether, apart from human intervention, the diseases with which we are concerned "tend" to die out; and (*c*) to the question as to whether the present population of Ireland is less able to resist such a disease as phthisis than its former population.

(a) The Social and Sanitary Conditions of Ireland.

The changes which Ireland as a whole has undergone in social and sanitary conditions are intimately related to our subject, and may be summarised here.

(1) Ireland has shared with Great Britain the increased cheapness of

percentage of the great decline in the death-rate from phthisis shown by the English figures. Assuming, as is likely, that the same cause has operated in Ireland, the increase shown in its death-rate from phthisis ought to be greater than the recorded figures indicate. For the present purpose we may therefore ignore it. If a correction could be made the contrast between England and Ireland would not thereby be made less striking.

A further statistical point may be mentioned here. The population of Ireland is on an average much older than that of England, and than that of Ireland in the past, and as phthisis is more fatal in younger adult life than later, a correction is needed for this. On making the necessary correction, the corrected death-rate from phthisis in Ireland in 1891 became 17·7 instead of 19·3 per 10,000. In other words, the increase of the phthisis death-rate in Ireland is greater than the curves in fig. 5 indicate.

This is a convenient place for noting that the part of fig. 5 relating to phthisis in England and Wales is calculated from death-rates corrected for age and sex distribution kindly supplied by Dr. Tatham. Sir Shirley Murphy has also favoured me with the results of an elaborate calculation made in his office, which show that to compare with age and sex distribution like that of 1901 the death-rates from phthisis in London at earlier years, it is necessary to add the following percentages to the uncorrected death-rates: for 1871, male, 4·12 per cent., female, 2·56 per cent.; for 1881, male, 5·42 per cent., female, 3·78 per cent.; for 1891, male, 4·42 per cent., female, 3·03 per cent. The correction would not very materially alter the curve for London, given in fig. 6.

in London, as shown in each case by Percentage Deviations from the Average Death-rate for the entire period, 1869-1905. (For data see p. 44.)

food and of total cost of living which is so striking a feature of the past twenty-five years.¹

(2) This increased cheapness in living has not been counteracted by lower wages. Wilson Fox's tables² show that between 1870 and 1903 the wages of agricultural labourers have increased 23 per cent. in England and Wales, 45 per cent. in Scotland, and 42 per cent. in Ireland. They are still very much lower in Ireland than in Great Britain, but from our present standpoint the important consideration is that they have greatly increased.

(3) In housing, Ireland has greatly improved its position. In some respects its average condition is better than that of Scotland, which has experienced a great reduction of phthisis. In 1901, in Scotland 17·5 per cent. of the total dwellings, in Ireland 8·7 per cent., and in England 3·6 per cent. of the total dwellings consisted of only one room; furthermore, of these one-roomed tenements the proportion having five or more persons in each tenement was 3·27 per cent. in Scotland, 1·78 per cent. in Ireland, and 0·15 per cent. in England.³

There has been also a great improvement in the class of house occupied by the majority of the population. The figures on this point are given more fully elsewhere.⁴ In the following table they are summarised for the whole of Ireland:—

PERCENTAGE OF DIFFERENT CLASSES OF HOUSES IN IRELAND.

		1841		1861		1881		1891		1901
1st class	...	3·0	...	8·3	...	9·7	...	10·5	...	11·2
2nd „	...	19·9	...	37·6	...	46·9	...	53·6	...	59·3
3rd „	...	40·1	...	45·7	...	39·2	...	33·8	...	28·4
4th „	...	37·0	...	8·4	...	4·2	...	2·1	...	1·1
		100·0		100·0		100·0		100·0		100·0

The fourth class of houses comprises chiefly houses of mud or other perishable materials, having only one room and window; the third class, a rather better class of house, having two to four rooms and as many windows; the second class is equivalent to what would be considered a good farm-house, having five to nine rooms and windows; and the first class comprises all better houses. The changes in the proportion of these different classes of houses are set forth more clearly in fig. 7.

¹ For details see the previously quoted paper in the *Journal of Hygiene*, 1906, p. 329 *et seq.*

² Quoted in the same paper, and given in detail in the Official Blue Book, Cd. 2376, p. 5.

³ "The Housing of the People of Ireland during the period 1841-1900," by R. E. Matheson, LL.D., Registrar-General of Ireland.

⁴ *Journal of Hygiene*, 1906, p. 325, quoted from Dr. Matheson's paper.

In passing, evidence showing that the size of the dwelling does not necessarily govern the total death-toll from phthisis in a given population may be noted. Dr. Matheson¹ gives the following table of housing conditions, to which I have added the corresponding death-rates from phthisis, as an index of social misery:—

	Number of one-roomed tenements per cent. of total dwellings or tenements	Number of one-roomed tenements having five or more occupants each in every 100 tenements of all classes	Number of persons in one-roomed tenements, with five or more occupants in every 100 of the total population	Average death-rate from phthisis per 100,000 living in the three years, 1900-1-2
Dublin	36.70	8.69	10.61	329
Belfast	1.00	0.09	0.10	313
London	14.66	0.57	0.70	171
Liverpool	6.14	0.22	0.24	190
Manchester	1.90	0.04	0.05	208
Edinburgh	16.98	1.80	2.33	164
Glasgow	26.11	4.28	5.24	177

This does not imply that in a given town the death-rate from phthisis is not higher in the smaller and more overcrowded tenements. Abundant statistics show this to be the case. But it is clear from the above table that size of dwelling or even degree of overcrowding may be overshadowed by the effect of other influences.

(4) Further evidence of improvement in Ireland is furnished by the fact that the amount of income assessed to income tax has increased 25 per cent. between 1853 and 1890, although incomes between £100 and £150 have ceased to be assessed. As supplementing this somewhat deceptive test, which applies only to incomes over £150, reference may be made to the increase in wages of agricultural labourers (p. 23) and to the lodgments in savings banks, which increased from £2,700,000 in 1870 to £6,970,000 in 1894. Sir H. A. Robinson, in giving evidence before the Financial Relations Commission,² although he quotes marriage-rates and birth-rates and insanity-rates as evidence of national decadence in Ireland, and doubts "if there is much improvement in their financial condition," is emphatic as to the enormous improvement in the standard of living, the reduced rents, and the lowered cost of living. He states that the people do not live on potatoes as formerly: "perhaps one meal a day, but twenty years ago they lived on them almost entirely."

¹ *Loc. cit.*, p. 19.

² "Report of the Royal Commission on Financial Relations between Great Britain and Ireland," p. 207.

(5) The poor-law statistics at first sight appear to indicate an almost stationary amount of pauperism between 1880 and the present time (fig. 4). But if a statistical correction is made for the fact that the proportion living at ages of dependency has increased (see table on p. 29), the rates would then show some decline in the amount of total

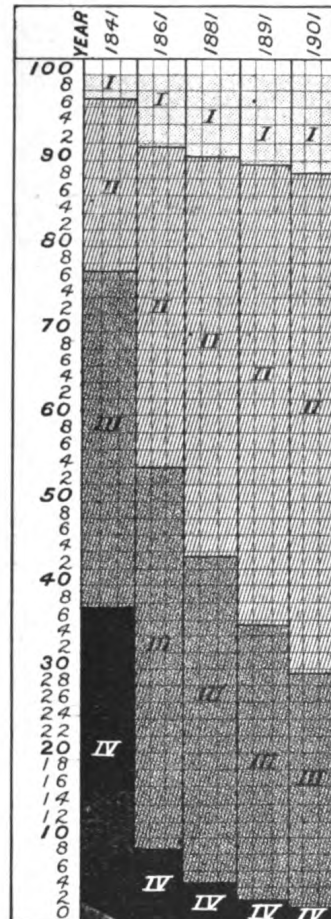


FIG. 7.

Showing steady improvement in Housing Conditions in Ireland.

pauperism. Even though some share in the non-decline of the rate of pauperism is due to the excessive proportion of the population which is of dependent ages, this does not make the excessive pauperism the less a burden on the community. This is so, and the fact is a serious handicap to the prosperity of Ireland. But even with this handicap there is no increase of pauperism during the last twenty years, and all the other indications show increased social prosperity during the same period.

A further correction in the poor-law statistics needs to be made, which cannot be expressed arithmetically. The amount of poverty relieved officially depends very largely on the system of relief adopted. In England the "house-test" has been insisted on to an increasing extent, and at the same time, since 1865, there has been an immense reform in the conditions under which the poor, and especially the sick poor, have been treated in the workhouses and infirmaries. The great decline of total pauperism, showing itself chiefly by decline of outdoor pauperism, has been undoubtedly aided by this method of administration. Ireland has pursued an exactly opposite policy. Beginning with a more rigid insistence on the indoor test for relief than has ever been enforced in England, it has gradually relaxed this test, until, as shown in fig. 4, it has settled down to a vast dispensary system of home-relief of the sick, along with a large amount of indoor relief, the statistical proportions of which are swollen by the fact that the workhouses and infirmaries of Ireland are used very largely as general hospitals, especially for surgical cases.¹ In the year 1903-4 the proportion of new cases of sickness attended either at outdoor dispensaries or in their own homes formed nearly one in eight of the total population of Ireland. If, then, it is taken into account that the poor-law institutions are used largely for the same purposes as voluntary hospitals in England, and that medical and general relief are given and accepted very readily at the homes of the people, there can remain little doubt that the non-decline of total pauperism in Ireland is due to statistical and administrative causes.

(b) *The "Tendency" of Certain Diseases to Die Out.*

The doctrine indicated above cannot be better described than in the following paragraph from a recent article in a medical journal:—

While these far-reaching controversies are being waged the disease (tuberculosis), in so far as England and Wales are concerned, continues to decrease, as evidenced by the death-rate. Indeed, the behaviour of the disease in this country seems to suggest that tuberculosis, like leprosy and typhus fever, may be tending towards extinction, and the problem in administration which is presented to all intelligent minds is as to the means by which the decrease in the death-rate may be accelerated.²

¹ For details see the evidence given before the recent Viceregal Commission on the Poor Laws, and *Journal of Hygiene*, July, 1906, p. 381.

² *Lancet*, July 30, 1907, vol. ii., p. 168.

A careful perusal does not indicate that any injustice is done by removing this extract from its context. It is remarkable that small-pox does not appear among the diseases enumerated, for small-pox is as clearly "tending" towards extinction as typhus and tuberculosis, and who shall say, in view of this mystical doctrine, to what extent its decline has been caused by vaccination, by sanitary administration, including prompt segregation of the sick, and by this "tendency towards extinction"? Probably, if the writer of the above words were questioned on the subject, he would, on reflection, disclaim a mere tendency towards extinction, which, like Melchizedek, is "without father, without mother, without descent"; and would define the word "tendency" as applying to factors of whose method of operation we know nothing. When thus reduced, the word leaves us less the victims of blind chance than at first appeared. The diseases enumerated, and we might add plague and malaria in this country to the list, have tended to extinction. No one now, acquainted as we are with the relation of rats to plague and of mosquitoes to malaria, would hesitate in giving first place to influences inimical to these carriers of infection, in bringing about the disappearance of these diseases from England; though he might be uncertain as to the exact mode by which the link in the chain of infection had been broken in each instance.¹ Similarly, although there may still be

¹ The history of the disappearance of endemic plague from England is full of interest in this connection. After having been domesticated in England for about three hundred years, this exotic infection finally disappeared as an endemic disease towards the end of the 17th century. The fiction that the Great Fire in London in 1666 caused its extinction still persists, as seen in a recent contribution on disinfection in the *Practitioner* (September, 1907). In actual fact, this fire only involved a part of London, many parts affected with plague escaping, and both London and provincial towns had cases of plague for years afterwards. Furthermore, as Creighton points out (vol. ii., p. 42), the streets and alleys of London were somewhat closely reproduced on the old foundations.

Creighton makes the very interesting suggestion that it was the substitution of coffin burial for burial in shrouds or cerecloths that was responsible for the disappearance of plague, acting, he suggests, by preventing contamination of the soil in the crowded churchyards. Although burial in stone or wooden coffins had been prevalent for the well-to-do, burial in winding-sheets only was still the usual method of burial in the time of Charles II. In 1666 Acts were passed permitting only woollen shrouds to be used in England (Acts 30 Car. II. c. 3 and 36 ejusdem c. 1). The first of these Acts was "for lessening the importation of linen from beyond the seas, and the encouragement of the woollen and paper manufactures of the kingdom." This Act was not repealed till 1815. The material generally substituted for linen was flannel. According to Misson, it was "not lawful to use the least needleful of thread or silk." The above Acts were intended to protect the English woollen industry against the Irish and foreign linen trade. It appears, however, that the use of woollen shrouds was very unpopular, and coffins rapidly replaced them towards the end of Charles the Second's reign.

The time of the Hanoverian invasion was then drawing nigh. And this brought with it, even during Queen Anne's reign, the brown rat, which rapidly decimated the number of the

differences of opinion as to the relative share borne by increased domestic cleanliness and the extensive segregation of the sick in producing the extinction of leprosy from this country, we have no doubt that these, and not a vague "tendency to extinction," have produced the result.

So also with typhus and phthisis. They are "tending to extinction" when their known methods of spread are impeded. They still spread when limits to their spread are imposed ineffectively. There may be and are, in regard to typhus, differences of opinion as to the relative share which diminution of malnutrition, of overcrowding, and of personal infection have had in bringing about the result, but history clearly shows that they are measurable factors and not mere "tendencies." So also with phthisis. In all these diseases it is unnecessary and unwise to suggest the existence of factors tending to extinction—for a "tendency" without some agency to produce it is inconceivable—not merely because it offends against the old logical rule, William of Occam's razor, "*entia non sunt multiplicanda præter necessitatem*," but chiefly because a mere suggestion, without investigation of and search after the unknown factor, is apt to make one believe that a real explanatory formula has been obtained, while investigation on known lines of causation is being neglected. I think, therefore, it is important to remember that when it is sought to connect the decrease in phthisis and typhus with an assumed tendency in these diseases to decrease apart from prophylactic measures, the explanation is supported by no evidence except the existence of the fact which it is sought to explain.

indigenous black rat. So rapid was the invasion of this larger brown rat that it was not among the least of the causes of complaint by the Jacobites against the new régime. The exact date of its invasion is doubtful. Pallas states that a great western movement of the brown rat was noticeable in 1727, and that it reached Paris in 1750. Professor Boyd Dawkins says that it reached England a little before 1730. Waterton states that it came from Hanover in a ship soon after the year 1688. Millais ("The Mammals of Great Britain and Ireland," 1905, vol. ii., p. 205 *et seq.*) says that "a middle date, that given by Pennant, who said that it appeared in England about 200 years ago, is probably somewhere about the correct time." This would be almost forty years after the Great Fire. Probably it came earlier than this. The change of rats was not complete, for black rats are still numerous in the Channel Islands, and are to be seen elsewhere in the United Kingdom.

From the preceding historical facts two possible alternative explanations of the disappearance of plague emerge. It may have been due to the change of species of rat, involving the overrunning of the country by a rat not infested by fleas which bite the human species. I suggest the tentative view that the coffin-burial was the more efficient agent in diminishing plague; not, as has been suggested, by diminishing the contamination of urban soil, but by preventing the predations of rats on the buried and uncoffined corpses and their subsequent raids on human food, and contamination more generally of dwelling houses.

(c) The Residual Population of Ireland.

In drawing inferences from the history of phthisis in Ireland, and from the comparison between its course and that of typhus in Ireland, it is necessary to ascertain whether this history has not been modified by decadence of the population.

The view is very commonly held that the long stream of emigration from Ireland (fig. 1) has left behind a physically inferior population excessively susceptible to phthisis. There has been much confusion in writing on this point, which can only be removed by separating the statistical from the social sources of inferiority. Emigration has produced the age distribution of population in Ireland shown in the following table:—

CENSUS POPULATION OF IRELAND AT DIFFERENT AGE PERIODS, STATED IN PROPORTION TO 10,000 PERSONS AT ALL AGES.

Ages	1861	1881	1901
Under 15	3,278	3,503	3,035
15—55	5,500	5,164	5,539
55—65	740	704	788
65 and over	482	629	638
All ages	10,000	10,000	10,000

It will be noted that there is a great increase in the number aged sixty-five and over between 1861 and 1881, but that since that time the number at these ages has remained fairly constant. When the present proportions at different ages are compared with those in England and Wales and Scotland the following results appear:—

Ages	England and Wales	Scotland	Ireland
Under 15	3,242	3,343	3,035
15—55	5,694	5,573	5,539
55—65	597	600	788
65 and upwards	467	484	638
All ages	10,000	10,000	10,000

Ireland evidently has a much larger proportion of aged persons in its population than either England or Scotland. This source of error can be corrected for, as has already been done for phthisis. Similarly, to compare the rate of insanity or the birth-rate (without the necessary correction in this instance for proportion of married people at child-bearing ages) of Ireland with that of England or Scotland, implies that

trustworthy comparisons of insanity or of fertility in the three countries are not obtained.

The greater average age of the population of Ireland in itself would tend to produce a higher rate of pauperism or of insanity per 1,000 of total population, and in actual fact, therefore, Ireland is seriously handicapped in its care of its paupers and insane by the results of emigration. There are, however, reasons for thinking that, apart from the greater average age of its population, the present population of Ireland is not physically inferior to its past.

(1) Some light is thrown on the subject by the birth-rate. This, when corrected as above indicated, has slightly increased in Ireland.¹ There is no evidence of decadence in this respect.

(2) The chief emigration from Ireland has been to the United States. If the cause of the increased death-rate from phthisis in Ireland is the physical inferiority of its residual population, the death-rate from phthisis of the Irish population in the United States ought to be lower than that in Ireland. It is practically certain that no disturbing influence in such a comparison is exercised by greater well-being or better sanitation or housing in Ireland than in the United States. The American Census Report for 1900² gives the death-rates from phthisis in the registration area and its subdivisions among whites in the census year, classified according to the birthplaces of the mothers of the deceased. For all inhabitants of these States the phthisis death-rate in 1900 was 113, for English (defined as above) 135, for Scotch 173, for Germans 167, for Irish 340. The difference is seen both in cities and in rural districts, the phthisis death-rate of the Irish in rural districts being 239 as compared with a general rate of 108. In Ireland in the same year the phthisis death-rate was 226 and in Dublin 346. These are death-rates uncorrected for age-distribution. For such correction we turn to the vital statistics for the City of Providence, Rhode Island, which are well known to be among the most trustworthy in the United States. Dr. Chapin, the city registrar and medical officer of health, has published statistics corrected for age distribution which enable a corrected comparison to be made. He applied³ the death-rate from phthisis in Ireland in 1901 for sex and age periods to the population of Providence in 1900

¹ See "The Decline of Human Fertility" (Newsholme and Stevenson), *Journal Royal Statist. Society*, vol. lxix., part 1, 1906, p. 40.

² "Census of the United States," 1900, vol. iii., *Vital Statistics*, part 1, p. clxxvii.

³ "51st Annual Report upon the Births, Marriages and Deaths in the City of Providence for the year 1905," by C. V. Chapin, M.D., p. 85.

born of Irish mothers. "It was found that the theoretical mortality from phthisis of this element of the population [of Providence] according to these [the Irish] data was 258 per 100,000 living. The actual rate for the period 1896-1905 was, however, 339. The mortality from phthisis of the Irish in Providence is therefore 81 per 100,000, or 31·4 per cent. more than the mortality of the Irish in Ireland." We may, I think, conclude that the Irish in America are a physically inferior population to an even greater extent than the Irish in Ireland, if physical inferiority is to be inferred from a high phthisical death-rate.

(3) Belfast is the part of Ireland which probably has suffered least from emigration and which is commercially the most prosperous. And yet the death-rate from phthisis was 307 per 100,000 of population in the five years 1901-6 as compared with 315 in Dublin.

(4) The physically inferior condition of the residual population in Ireland, contradicted by the preceding considerations, was equally improbable in view of the history of Ireland since the great famine. However lamentable from other points of view is its steady stream of emigration, the majority of those driven out were among the poorest, and these, owing to their extreme poverty, must have been among the least fit. This is shown by the figures on p. 10. The cottiers and farm labourers on the smallest holdings were those who emigrated in the largest numbers; and although the great clearances and the formation of large grazing farms (see p. 15) have made Ireland a land of silence, those remaining are children of the families who could resist the extrusive force of evictions, &c., and who since that period have been living under progressively better conditions than their predecessors in the more distressful past.

Review of the Factors causing Typhus, and of those Securing its Steady Progress towards Extinction.

(a) *Specific Infection.*—Our survey of the history of typhus in Ireland shows that the disease has been associated with infection, malnutrition, overcrowding and vagrancy. The difficulty in assigning to the last three factors their relative importance in determining epidemics lies in the fact that they mostly occur and vary together. The frequency with which each of them has been associated with the disease has left no doubt of the influence of all of them on its course. Indeed, the evidence of this influence is so strong, and the difficulty of tracing the importation of infection has been sometimes so great, that the necessity of the introduction of a specific organism has not infrequently been called in

question. Thus Jacquot, the French medical historian of the Crimean war, wrote :—¹

Pas une contestation ne s'est élevée au sujet de la cause du typhus ; les faits sont clairs et parlants ; le typhus spontané est dû aux miasmes humains qui s'exhalent au milieu de l'agglomération, de l'encombrement, etc. *On peut faire naître le typhus à volonté, pour ainsi dire.*

More recent writers give an opinion which is more in accord with our general knowledge of infective diseases. Thus Dr. F. M. Sandwith² says :—

It is often impossible to trace the infection, but the old doctrine of spontaneous generation of typhus is opposed to all analogy, and need not be discussed. . . .

Similarly, Professor Curschmann, of Leipzig,³ says :—

If such objects (clothing, curtains, carpets, &c.) are protected against contact with air, the contagion clinging to them may maintain its vitality for many months, or even longer under especially favourable circumstances, and the disease may thus be carried to distant localities. . . . Such a transmission of the poison would furnish the most natural etiological explanation of the well-known so-called spontaneous epidemics in prison, on board ships, &c. . . . Healthy persons may, without becoming infected themselves, carry the poison in their clothes or in their hair. . . .

It is certain that the disease does not arise spontaneously. . . . The condition of the individual, especially a depraved state of nutrition and loss of vital energy due to the effects of poverty, hunger and disease, exerts an enormous influence on the disposition.

Between these two extremes comes an alternative which differs from the theory of *de novo* origin theoretically rather than in its practical conclusions. This is suggested, for instance, in the account of a small outbreak in an English town in 1890,⁴ in which "it was found entirely impossible to discover any source of infection as a cause of either of the two portions of this outbreak," and the narrator confirms the common experience by his own, that it had been "the exception to be able to find a history of possible or probable infection from others"; and adds that the outbreak seems to suggest, "unless we are prepared to admit a *de novo* origin, the more or less universal existence of a specific organism which under ordinary circumstances does not develop sufficiently to display its potential infectivity, but which under special

¹ "Du Typhus de l'Armée d'Orient," Paris, 1858; quoted on p. 248 of Sir J. W. Moore's "Continued and Eruptive Fevers."

² "The Medical Diseases of Egypt," part 1, p. 18.

³ In Nothnagel's "Cyclopedia of Practical Medicine," *Amer. Trans.* 1902, pp. 485 and 498.

⁴ *Public Health*, vol. iii., 1890, p. 16.

conditions may so develop. These favouring conditions, in the case of typhus fever, are mainly dirt and destitution."

The difficulty in the way of this suggestion is the fact that those conditions of dirt and destitution which are suggested as causing the disease have been repeatedly present, even in districts near which typhus has been prevalent, and yet no outbreak has occurred; and the alternative etiology of specific infection is supported by the fact that, so far as is known, such places have received no imported infection. The enormous balance of recorded opinion in recent years has regarded imported infection as an indispensable antecedent to a typhus epidemic, and with this opinion I agree.

(b) *Malnutrition*.—The acceptance of specific infection as necessary to the disease does not, however, determine what influence is exerted on its epidemic prevalence by agencies which may respectively foster and spread it. Authority as to the effect of malnutrition is conflicting. Thus Murchison¹ says:—

All the great epidemics which have devastated Ireland, Great Britain, and other parts of the world, have occurred during seasons of scarcity and want. . . .

The great predisposing cause of typhus is defective nutrition.²

He adds, however, that

Famine only generates typhus, in so far as it causes overcrowding.³

Bateman⁴ appears to have been the first definitely to state that "deficiency of nutriment is the principal source of epidemic fever." Corrigan, in 1846, wrote his well-known essay "On Famine and Fever as Cause and Effect," and the notion of hunger-fever became widely adopted. Graves, of Dublin, however, in 1843, wrote the following remarks:—⁵

In my report of the fever which devastated the west of Ireland in 1822, I advanced the opinion that such epidemics are brought on by a great dearth of provisions, and their unwholesome quality. These are, no doubt, aggravating circumstances, but that they are not the sole or even the chief causes of typhus epidemics is evident from what I have since frequently witnessed, viz., the occurrence of fever epidemics during years of plenty, of which 1826 was a remarkable example.

¹ Murchison: "The Continued Fevers of Great Britain," 1888, p. 76.

² *Ibid.*, p. 119.

³ *Ibid.*, p. 80.

⁴ Quoted by Hirsch, "Geog. and Hist. Pathology," *Syd. Soc. Transl.*, vol. i., p. 579.

⁵ Graves, "Clinical Medicine" 1843, p. 41.

Graves's view has been confirmed by subsequent experience. Famine years have occurred in many countries without typhus, and communities subject to famine in years of epidemic typhus have escaped it, when they were isolated from imported infection. Conversely, in the Dundee epidemic of 1865-66 the workmen who suffered severely were earning good wages, but were overcrowded owing to the prosperity of Dundee's trade and manufactures, and the consequent large immigration from country districts. On the same point the following remarks by Sir Wm. Moore¹ are pertinent. Referring to the Irish epidemic of 1846 he says :—

The Irish physicians of the day asserted that this Irish fever was particularly and distinctly due to famine. But, as a matter of history, the fever in Ireland began in 1842, before the famine.

Similarly, speaking of a famine camp, he says :—²

In India, where the people, especially in a famine camp, live almost *sub Jove*, there will be no typhus.

On these facts, therefore, it does not appear probable that malnutrition has been the most important of the remaining three powerful agencies in the causation of typhus. The suggestion to the contrary has been frequently made ; and it is useful to remember in this connection that poverty and its associated malnutrition and overcrowding have similarly been made responsible for other diseases. Thus Dr. Dickson,³ speaking of the plague in 1876 in Irak-Arabi, said :—

The most palpable and evident of all the causes which predispose an individual to an attack of plague during an epidemic outbreak is *poverty*. No other malady shows the influence of this factor in so striking a degree ; so much so, indeed, that Dr. Cabiadis styles the plague *miseriæ morbus*.

There is no doubt or difference of opinion as to the view that poverty produces conditions favouring infection in plague, as in many other diseases. Recent work, however, has shown that far more direct agencies than privation are responsible for its epidemic appearance, and at the present day no one would dream of regarding the amelioration of poverty as the most immediate and powerful means of restraining epidemics of plague.

¹ Sir William Moore on "Famine: its Effects and Relief," *Epid. Soc. Trans.*, vol. xi., 1891-92, p. 36.

² *Loc. cit.*, p. 37.

³ Quoted by Hirsch, *loc. cit.*, vol. i., p. 524.

(c) *Overcrowding*.—Overcrowding as a cause of typhus and other infectious diseases has a multiple significance. It is certainly an index of intimacy of contact and consequent freer opportunities for the carriage of infection on a sufficiently massive scale to be effective. It may also with a high degree of probability be regarded, like malnutrition, as undermining the powers of resistance to microbial infection; or some more subtle condition of infection may be caused by it. The view commonly held until recent years, and even now maintained in an attenuated form, is that, in accordance with the dictum of Hildebrand in 1814, "the source of all typhus matter is to be looked for solely in concentrated human effluvia." Hirsch puts the less extreme view of this doctrine in the following words:—

The idea that overcrowding in filthy and unventilated rooms affords the essential condition for the development of typhus-foci and for the spread of the disease has been completely borne out by the experience of all times.

This view implies that overcrowding involves concentration of virus as well as greater opportunities of infection, and there is no reason to disagree with it; though, as nurses commonly acquire typhus while nursing cases of that disease under good conditions, it cannot be regarded as proved that concentration of virus as well as free opportunities of infection are needed for its propagation. If it should be proved that fleas are the chief, if not the sole, means by which it is spread,¹ the practical importance of diminishing overcrowding and of securing domestic cleanliness will be seen to consist, so far as typhus is concerned, chiefly in the annihilation of these domestic pests. It must increase the effectiveness of preventive measures against any disease to be able to add specific to general precautions, as has been shown strikingly in the cases of malaria and plague. But, with full recognition of the ways in which overcrowding must have favoured typhus in Ireland, it is difficult to regard the facts as consistent with its having played the predominant part. We have seen that the epidemic peaks of typhus in Ireland occurred when famine and vagrancy were working in close and invariable conjunction, and that districts where famine occurred without vagrancy escaped. At these periods the pestilence showed epidemic peaks both in overcrowded towns and in sparsely populated rural districts. Probably in many of these rural districts the low density of population per acre was not inconsistent with considerable overcrowding per room; but the

¹ On this point see a valuable report by Professor Matthew Hay, *Public Health*, September, 1907, p. 772.

universal prevalence of the disease wherever traffic was unrestrained makes it fairly clear that there must have been much typhus where overcrowding in both senses of the word was absent. This view is confirmed by the movements of population associated with famine. Depopulation occurred on a gigantic scale, and yet the diminution of overcrowding thus produced failed for a long time to make material reduction in the pestilence, though it passed with the emigrants into the ports which received them and determined there epidemic peaks of considerable magnitude.

Phthisis in Ireland.

These considerations appear to me to indicate vagrancy as the most effective of the influences favouring the spread of typhus, and the immobilisation of infection by the diminution of vagrancy and the provision of hospital accommodation as the main cause of diminution of its spread in Ireland. The history of phthisis in Ireland confirms this conclusion, and although the argument from analogy must always be used with caution in inferences from one disease to another, it is instructive to consider certain points in regard to typhus and phthisis. It is common ground that, far more than most diseases, phthisis is affected by privation and overcrowding. Typhus is like phthisis in this respect, though there is no evidence that it is more sensitive to these influences than is phthisis. It may possibly be less sensitive; for the infection of typhus is distributed over a few weeks, that of phthisis over several years; overcrowding and destitution, therefore, have much more time to intensify infection and lower resistance to it in the latter than in the former disease.

As we have seen, privation and overcrowding have both decreased very materially in Ireland; but the history of phthisis in that country shows that these ameliorations have not sufficed to overcome other influences tending to increase the death-rate from phthisis (figs. 5 and 6). This fact makes it the more difficult to believe that these ameliorations have been the most effective of the factors producing a decline in the death-rate from typhus of the magnitude shown in figs. 5 and 6.

It appears to me, moreover, that the history of phthisis in Ireland throws a more positive light on the predominant cause of the decrease in typhus. The reduction of typhus and the increase of phthisis have both of them been associated with poor-law administration.

It has been noted that at first outdoor or domestic relief under the Irish Poor Law was very restricted, but that as time passed the poor-law

policy of Ireland was changed, medical and other forms of relief being freely given to persons still living at home. A glance at fig. 4 will show that during the last quarter of a century outdoor has been more largely given than indoor relief, especially when allowance is made for the fact that indoor relief includes the provision of a large portion of the general hospital accommodation of Ireland. Associated with this changing administration was the fact that residential conditions of relief were imposed, which from the first, and still more as the system of poor-law relief became better organised, tended to prevent those vast movements of vagrancy and mendicancy with which Ireland had been cursed. What would be the effect on typhus and on phthisis of (1) the increasing immobilisation of the population in their own districts, and of (2) the increase in the proportion of sickness in the aggregate, and especially of phthisis, treated in the homes of the people? The readiness with which domestic doles and medical treatment both at home and at the dispensary could be obtained undoubtedly led to the greater portion of the lives of consumptive patients being spent at home. For typhus fever it was otherwise. Here was a disease which, unlike phthisis, was not infectious for several years but only for two or three weeks, and which disabled immediately instead of after protracted ill-health. The objections of the Irish to the infirmary were easily overcome for this disease, only exceptionally in the case of phthisis. Hence the same measures which were successful for typhus, led to an actual increase of phthisis. Typhus has been brought towards the point of extinction by its institutional treatment, acting in conjunction with the removal of the motives for vagrancy. Phthisis has been rendered even more prevalent than formerly by increasing for this disease domestic at the expense of institutional treatment, and by thus continuing the enormous number of domestic foci of this disease which are implied by the home-treatment of phthisis among the poor.

Analysis of Individual Epidemics.

It is regrettable that the data available for Ireland have necessitated the examination of this question to so large an extent on general considerations. During the period of greatest prevalence of typhus no exact statistics were available, and it has been impossible to supplement my general examination by intimate analysis of the course of any one or more epidemics in particular districts of Ireland, as I am unacquainted with any work that would enable this to be done. It is fortunate that we are able to check the inferences derived above from the broad survey

of the history of typhus in Ireland by two investigations, one English and one French. In these two we are able to approximate towards a test as to whether what may be called the intimate structure of an epidemic confirms the conclusions to which our general considerations point.

Mr. Spear, in the Annual Report of the Medical Officer to the Local Government Board for England, 1886 (p. 269), described a series of outbreaks of typhus in various parts of England, 1886-7. Some of these had not before his visit been recognised as typhus, and it is interesting to compare the date of their occurrence with that of the epidemic of typhus in Ireland in the immediately preceding years. Mr. Spear particularly draws attention to the frequent occurrence of unrecognised cases in children, and to the circumstance that "information as to typhus outbreaks is peculiarly liable to be incomplete"; though in a later part of his report (p. 285) he adds:—

I cannot admit that any argument in favour of the so-called *de novo* origin of the disease can be logically deduced from the frequent failure to demonstrate the source of typhus outbreaks.

It is unnecessary for me to give the details of the outbreaks in twelve towns described by Mr. Spear. In five towns there was "strong probability" that the disease had been introduced from without, by tramps, returned hop-pickers, and once by a discharged prisoner. In three other towns the outbreak originated in the Irish quarters, in parts where there was free communication with Ireland, &c. It would be interesting to tabulate a similar series of outbreaks of small-pox, and ascertain whether the proportion in which the source was detected would be so much higher than for typhus as the more readily recognisable nature of the disease would lead one to expect.¹

MM. Netter and Thoinot have summarised an account of a widespread epidemic of typhus in France which during the years 1892-3 spread over fifteen *départements*. Altogether 1,066 cases are known to have occurred, the highest number being 200 in the *département* of La Somme. In the majority of districts the source of the outbreak could be traced, and the reporters sum up their investigation, so far as the diffusion of the disease is concerned, in the following words:—

Le typhus de 1892-93 peut être caractérisé d'un mot: il a été avant tout le typhus de *vagabonds*: dans la *marche*, dans la *diffusion* de l'épidémie, dans la création des foyers, les vagabonds ont joué le rôle primordial.

¹ It is scarcely necessary to do more than refer to the valuable work of Dr. H. A. Armstrong in demonstrating what a large majority of the recent small-pox outbreaks in England are due to vagrants.

There is the further analogy between this French and our English outbreaks of typhus, that France has an Ireland, an endemic focus of typhus, in Brittany, from which epidemics have at various times spread.

There can then, in spite of the difficulty which the case presents, be no hesitation in arriving at the conclusion that vagrancy has played the predominating part in the dissemination of typhus in Ireland, and that the decrease of the disease must be attributed to the poor-law provisions for immobilising infection by the suppression of vagrancy and the provision of fever wards, the part played by the decrease of poverty being of notably less importance. From a practical standpoint this result appears to me eminently encouraging. The ultimate objective of all who are interested in the common well-being must be to mitigate poverty. The magnitude of this task can scarcely be realised. But the task is surely lightened by any means which can be shown to be wholly effective in controlling a poverty-producing disease, without waiting for the attainment of the main and major goal. Every disease thus controlled frees the community not only from a measurable amount of sickness, but from the amount of poverty implied by this sickness.

It is no disparagement of the paramount importance of improved housing and nutrition, in the protection and enhancement of the public health, to find independent means of controlling individual diseases. It is, on the contrary, a step forward in social amelioration, the funds thus saved being available for further ameliorative work.

We may infer more generally, in considering diseases like typhus and phthisis, to which poverty is contributory, that there is much practical advantage not only in seeking to divide the consideration of poverty into that of its component parts, but also in seeking to define the operation of factors other than poverty. We are thus enabled to particularise in our preventive efforts, with confidence that each set of measures will help towards attaining the object of the others. If, on the contrary, measures of only secondary importance in connection with a disease are treated as if they were primarily important, we have failed to exercise frugality in administration, and to that extent have been responsible for inefficiency.

What I have said to-night, while it confirms what is already known as to the important bearing of well-being on the prevention both of typhus and of phthisis, indicates that at the present time the largest measure of control over them, and especially over phthisis, can be obtained by administrative measures, and that we cannot afford to leave the abolition of phthisis to the relatively slow evolution of measures of sociological reform.

Summary of Argument.

(1) Epidemiology in its relation to administration is concerned not merely with the nature, but also with the relative extent of the influences affecting the public health.

(2) The evils associated with and due to poverty favour both typhus and phthisis, and it is important to know which of these evils has been the most efficient in determining the courses of these diseases.

(3) Historically the great epidemics of typhus have occurred in Ireland in years of famine. In these years overcrowding was not generally increased, but nutrition was decreased, and vagrancy was greatly increased. Such local increases of overcrowding as occurred were the result of this widespread vagrancy, and while vagrancy and famine persisted even wholesale depopulation did not arrest the epidemic.

(4) The introduction of poor-law relief at the expense of local funds, and especially the "quarter-acre clause" in the enactment, induced in years of famine evictions on an enormous scale, which in their turn swamped the resources of the poor-law, and led to vagrancy and emigration affecting a very large portion of the entire population.

(5) The continued provision of poor-law relief had a considerable effect in immobilising an acute disabling disease of short duration like typhus, though its institutional form was unpopular and inefficient in respect of a chronic disease like phthisis.

(6) In considering whether increased immobilisation of patients, diminished overcrowding, or improved well-being of the community has been the chief agent in reducing typhus, a comparative study of the course of phthisis in Ireland is needed. Phthisis is a disease the communal prevalence of which is influenced by well-being and by the diminution of overcrowding, but which is more powerfully influenced by segregation of patients, especially of advanced patients. In Ireland great reduction of overcrowding and improvement of conditions of housing and of general well-being have been accompanied by decrease of typhus but increase of phthisis. Some more powerful influence must have countervailed the influence of improved housing and greater well-being on the course of phthisis, and unless typhus is more susceptible than phthisis to the influence of improved well-being, the decrease of typhus probably has been due predominantly to the same cause, while in the case of typhus this cause presumably has assisted these beneficent influences. The influence which had the predominant share in causing the decrease of phthisis in those countries in which decrease

has occurred was the immobilisation of infection. Immobilisation of an acute disease of short duration like typhus, even though the immobilisation is largely domestic, when associated with the prevention of vagrancy of relatives, prevents the wide and rapid spread of infection. Immobilisation in a protracted disease like phthisis, in order to be efficient, must be institutional, especially for advanced cases. The degree of immobilisation secured in Ireland is such as on these principles sufficed to control typhus, but not phthisis.

(7) An examination of the economic history of Ireland supports the above considerations. There is no evidence of any spontaneous tendency of the diseases in question to die out. The increase of phthisis is not to be explained by decadence of population, the evidence showing that the residual population in Ireland is superior physically to the emigrated population.

(8) Of the operative causes of typhus, specific infection is admitted generally to be indispensable. Malnutrition has not always been associated with epidemics of this disease, and there has been no constant association of epidemics with exceptional overcrowding, or cessation of epidemics when overcrowding has been enormously reduced. Vagrancy is the one factor which has always accompanied specific infection, and in the absence of which epidemics have failed to occur even in the vicinity of infected populations.

(9) The records available have usually lacked the exactitude required for checking these general considerations by the analysis of large epidemics into separate cases. In two instances summarised in this address such an analysis is provided, with the result that in the English instance vagrancy was the only origin assignable in those instances in which an exact history could be obtained; and the French epidemic of over 1,000 cases, distributed over a large part of France, consisted almost entirely of cases among or derived from tramps.

(10) The suppression of typhus in Ireland has been due chiefly to the efficient immobilisation of infection by means not intended expressly for that purpose. These means have failed to control phthisis, because the extent and duration of immobilisation which suffice for typhus do not suffice for phthisis. Both England and Ireland, though not on the same level, have enjoyed increased well-being for many years. England for many years has treated a very large proportion of its advanced cases of phthisis among the poor in public institutions under reformed conditions, and has secured a large decrease in its phthisis death-rate; Ireland has encouraged to an increased extent the domestic treatment of

these cases, and its phthisis death-rate has increased. In the future the control of typhus can be continued, and that of phthisis improved, more rapidly and effectively by immobilisation appropriate to the disease than by awaiting the slow operation of relief of poverty, which is the chief object of economic effort. To this end it will be necessary in Ireland, as in England, to pursue the institutional treatment of phthisis, especially of advanced cases, on a scale not hitherto contemplated, and to abandon poor-law restrictions and disabilities, which render such institutional treatment unattractive.

DATA FOR FIG. 4.

Pauperism.

		Total (top line of diagram)	Indoor (lower line of diagram)			Total (top line of diagram)	Indoor (lower line of diagram)
1851-2	...	2,610	...	2560	1879-80	...	1,792
1852-3	...	2,088	...	2040	1880-1	...	2,200
1853-4	...	1,566	...	1540	1881-2	...	2,168
1854-5	...	1,342	...	1310	1882-3	...	2,150
1855-6	...	1,065	...	1050	1883-4	...	2,164
1856-7	...	865	...	849	1884-5	...	2,111
1857-8	...	794	...	773	1885-6	...	2,151
1858-9	...	708	...	686	1886-7	...	2,535
1859-60	...	740	...	706	1887-8	...	2,299
1860-1	...	736	...	675	1888-9	...	2,262
1861-2	...	1,030	...	933	1889-90	...	2,223
1862-3	...	1,118	...	1010	1890-1	...	2,207
1863-4	...	1,134	...	996	1891-2	...	2,216
1864-5	...	1,120	...	965	1892-3	...	2,175
1865-6	...	1,087	...	908	1893-4	...	2,177
1866-7	...	1,175	...	954	1894-5	...	2,157
1867-8	...	1,259	...	987	1895-6	...	2,150
1868-9	...	1,273	...	965	1896-7	...	2,137
1869-70	...	1,249	...	913	1897-8	...	2,226
1870-1	...	1,256	...	860	1898-9	...	2,394
1871-2	...	1,269	...	851	1899-1900	...	2,258
1872-3	...	1,393	...	881	1900-1	...	2,217
1873-4	...	1,459	...	893	1901-2	...	2,255
1874-5	...	1,453	...	880	1902-3	...	2,275
1875-6	...	1,413	...	840	1903-4	...	2,277
1876-7	...	1,439	...	840	1904-5	...	2,303
1877-8	...	1,537	...	903	1905-6	...	2,414
1878-9	...	1,648	...	961			

DATA FOR FIG. 5.

Deviation from mean of—

		Typhus, Ireland		Phthisis, Ireland		Phthisis, England		Typhus, England
1869	...	+83	...	-11	...	+36	...	+550
1870	...	+54	...	-11	...	+40	...	+400
1871	...	+79	...	-6	...	+36	...	+310
1872	...	+46	...	-6	...	+32	...	+170
1873	...	+45	...	-6	...	+27	...	+136
1874	...	+59	...	-14	...	+21	...	+149
1875	...	+47	...	-6	...	+28	...	+109
1876	...	+31	...	-7	...	+23	...	+62
1877	...	+53	...	-4	...	+20	...	+52
1878	...	+59	...	-4	...	+23	...	+21
1879	...	+60	...	-1	...	+17	...	-29
1880	...	+100	...	+4	...	+9	...	-29
1881	...	+86	...	-6	...	+6	...	-29
1882	...	+62	...	-2	...	+8	...	+21
1883	...	+80	...	+5	...	+9	...	+12
1884	...	+41	...	+3	...	+6	...	-59
1885	...	+15	...	+6	...	+3	...	-59
1886	...	-9	...	+6	...	+1	...	-70
1887	...	-7	...	+4	...	-7	...	-73
1888	...	-16	...	± 0	...	-10	...	-80
1889	...	-16	...	+1	...	-10	...	-83
1890	...	-7	...	+5	...	-3	...	-83
1891	...	-36	...	+4	...	-8	...	-83
1892	...	-35	...	+6	...	-16	...	-89
1893	...	-45	...	+4	...	-17	...	-83
1894	...	-43	...	+2	...	-21	...	-86
1895	...	-53	...	+4	...	-21	...	-93
1896	...	-69	...	-3	...	-26	...	-93
1897	...	-70	...	+4	...	-24	...	-93
1898	...	-45	...	+4	...	-26	...	-96
1899	...	-71	...	+2	...	-26	...	-96
1900	...	-68	...	+10	...	-26	...	-96
1901	...	-76	...	+4	...	-30	...	-96
1902	...	-79	...	+3	...	-32	...	-93
1903	...	-81	...	+5	...	-33	...	-93
1904	...	-87	...	+8	...	-32	...	-96
1905	...	-83	...	+2	...	-37	...	-96

DATA FOR FIG. 6.

Deviation from mean of—

		Typhus, Dublin		Phthisis, Dublin		Phthisis, London		Typhus, London
1869	...	+117	...	- 5	...	+31	...	+720
1870	...	+324	...	- 4	...	+29	...	+440
1871	...	+262	...	- 4	...	+22	...	+330
1872	...	+151	...	+ 7	...	+20	...	+ 90
1873	...	+ 68	...	+ 4	...	+20	...	+198
1874	...	+218	...	-15	...	+15	...	+231
1875	...	+ 56	...	- 4	...	+21	...	+ 35
1876	...	+ 97	...	- 8	...	+18	...	+ 64
1877	...	+135	...	- 4	...	+14	...	+ 60
1878	...	+211	...	-13	...	+17	...	+ 49
1879	...	+167	...	+ 4	...	+15	...	- 31
1880	...	+399	...	+ 7	...	± 0	...	- 27
1881	...	+448	...	± 0	...	+ 3	...	- 13
1882	...	+139	...	+ 2	...	+ 3	...	- 49
1883	...	+293	...	+14	...	+ 8	...	- 49
1884	...	+123	...	+11	...	+ 6	...	- 71
1885	...	+ 48	...	+ 8	...	± 0	...	- 74
1886	...	+ 5	...	+ 8	...	- 2	...	- 89
1887	...	- 40	...	+ 8	...	- 9	...	- 82
1888	...	- 18	...	- 3	...	-14	...	- 93
1889	...	- 49	...	+ 2	...	-12	...	- 85
1890	...	- 35	...	+ 9	...	+ 2	...	- 93
1891	...	- 83	...	+ 3	...	- 5	...	- 89
1892	...	- 77	...	+ 9	...	-11	...	- 89
1893	...	- 58	...	+ 7	...	- 9	...	- 96
1894	...	- 72	...	+ 2	...	-18	...	- 96
1895	...	- 94	...	- 2	...	-14	...	- 96
1896	...	- 70	...	- 7	...	-17	...	- 96
1897	...	- 64	...	- 7	...	-16	...	-100
1898	...	- 95	...	- 2	...	-16	...	- 96
1899	...	- 86	...	+ 2	...	-10	...	-100
1900	...	- 95	...	+ 7	...	-16	...	-100
1901	...	- 92	...	± 0	...	-19	...	- 96
1902	...	- 78	...	- 1	...	-23	...	-100
1903	...	- 95	...	- 5	...	-25	...	- 96
1904	...	- 97	...	± 0	...	-21	...	-100
1905	...	-100	...	- 6	...	-32	...	-100

Epidemiological Section.

November 22, 1907.

Dr. H. T. BULSTRODE, Vice-President of the Section, in the Chair.

Medical Inspection in Schools : the Gloucestershire Scheme.

By MYER COPLANS, M.D.

IN the summer of 1904 it became necessary for the Gloucestershire Education Committee to consider the condition of certain elementary schools, at which the attendances had become seriously impaired by reason of the continued prevalence among the scholars of various forms of skin disorder. A provisional scheme, involving inspection of small groups of schools by the medical practitioners nearest resident, had been fully discussed and abandoned on the ground that administrative difficulties would prove insuperable.

On being approached to carry out the proposed inspection, I pointed out to the Authority that there were no defined powers enabling me to carry out an examination of school children save with the parents' consent ; moreover, the result of such an examination must be considered private as between a doctor and his patient ; and, finally, the only method to be adopted in effecting amelioration of special or general conditions must be in the nature of moral suasion. Thereupon I was given a free hand to devise some scheme which, while satisfying the parents, would elicit especially the main facts relating to the degree of prevalence of various forms of skin disease among the scholars ; it was left for me to devise means for the betterment of such conditions as might be found.

The area specially selected for carrying out this scheme was that of the Stroud Union, which comprises the urban and rural districts of Stroud as well as the urban district of Nailsworth ; the total population is 40,000, spread over some 60 square miles of hilly country. The

number of separate schools to be inspected was 58, and the average number of scholars on the books was 7,200.

To arrive at some preliminary scheme, I considered it essential to interview as many parents as possible, in order to obtain a frank expression of all shades of opinion. To all I explained the purport of the proposed scheme—to carry out, with the parents' sanction, such a system of medical inspection as would best cope with the various evils that were said to arise in association with school life or in consequence thereof. There were many who considered that the proposed experiment ought to go further and embrace both private and secondary schools, Sunday schools, Band of Hope meetings and the like; otherwise it might appear that an attempt was being made to introduce a medical scheme which, in the end, would have the effect of exposing and accentuating the poverty of the poor. All were united on the point that the relationship between doctor and scholar must be confidential.

The outcome was a card schedule, and, in order that I might have duplicate entries of all important information, the medical register form was adopted. It was intended that there should be a separate card for each scholar, while the medical register forms were to be filled up according to standards. Manifestly the card scheme was intended to secure a continuity of record in the case of each individual child; and it was hoped that these records would be of value in the future study of the complex conditions of school life. Early and continuous information, moreover, would be furnished of affections of the special senses and of those abnormalities of mind and body which render a separate classification imperative in any well-organised educational system. The card schedule was designed to meet the varying requirements of individual parents; all were reassured that the status of confidence as between doctor and patient was to be maintained; an attempt was to be made to deal with contagious disease, and statistics as to past outbreaks were to be collated and studied; the individual scholar was to be kept under continuous observation, so that school life might prove less arduous and more profitable, nor would change of school affect the record.

In dealing with infectious disease and contagious conditions, it was recognised that diagnosis without the corollaries of isolation and disinfection was useless; so, with the medical inspection in general, there would be little profit to educational life without available classifying and remedial agencies.

It was hoped that parents would in the first place readily assent to the scheme, and that, once confidence had been established, they would be

prepared to avail themselves of the advice which subsequently might be tendered to them. Thereupon I invited the head teachers to a conference, where I put it to them plainly that the success of the scheme would depend mainly, perhaps entirely, upon their loyal co-operation. The proposed experiment was explained to them in detail; they in their turn were to explain the matter to their elder scholars and interview parents if necessary; particularly this would be found necessary with infant schools. To each head teacher I gave a supply of cards, sufficient for distribution among the scholars; the cards were to be taken home to the parents, the important object at that stage being to obtain their consent in writing, while making all fully acquainted with the scope of the proposed investigation.

The outcome of this method of procedure was that 97 per cent. of the parents consented. It was at this stage that I realised fully the powerful influence of the head teacher with the parents, and his authority over the scholars. Parents were allowed at least a week to fill up the card and vouch for the record of the child's illness. In general, they took great pains to give reliable information. All avenues of information and confirmation as to exact dates seem to have been opened up. Some consulted their private medical advisers, others their neighbours, and in some instances I was able to verify statements as to epidemic diseases from past epidemic-grant records.

Cases of boarded-out children from metropolitan poor-law institutions, Dr. Barnardo's waifs, as well as children from the local poor-law institution, afforded instances in which such information was unobtainable; nor in these cases was it possible to obtain the exact date of birth, a factor of importance in co-relationship with anthropometric data. It was in reference to these data, as well as to the prevalence of tuberculous conditions, that particulars were asked for as to the parents' occupation.

The Sunday school was registered for the reason that it might afford a clue as to the child's companions and doings after ordinary school hours—points of importance in dealing with contagious and zymotic disease, either in tracing the origin or in attempting remedial measures. Those head teachers who acted as Sunday-school superintendents volunteered, when occasion arose, to apply in the Sunday school such measures of isolation and disinfection as would be considered appropriate in the day school.

The precise date of birth was available in the majority of cases. With waifs and boarded-out children, however, such information was unreliable.

Many children had been entered in the school registers at ages slightly in advance of their true age, and the youngest child found in school, presumably aged 3, proved to be but 2 years and 8 months old. There were several reasons for over-stating the true age. First of all, it permitted a child to be entered on the registers as of the minimum age—viz., 3—a month or two earlier; secondly, a scholar having reached the presumed age for leaving school would be withdrawn from school and sent to work before actually reaching the prescribed age-limit; indeed, I met with one extreme case in which the child's age was over-stated by nearly one year, the real purpose being to make it possible for the scholar ultimately to leave school a year sooner than the law intended. The circumstances which rendered such a fraud comparatively easy arose from the fact that the child's elder brother, bearing the same Christian name, had died in very early infancy, and the first child's certificate of birth was utilised for the second child. There are records of parents who have wilfully altered birth-certificates in order that their statements as to children's age might be confirmed.¹ These points emphasise the necessity for the introduction into schools of some reliable system of age registration, without which the value of anthropometric data is manifestly impaired.

Inspection of the Scholars.—I proposed conducting the inspection of the scholars in several stages. At the first inspection: Examination for skin disease; state of vaccination; auscultation in special cases; anthropometric data; notes as to general and special points; *e.g.*, clothing, swimming. Second inspection: Eye examination; notes as to school buildings. Third inspection: Ear and throat examination; mental abnormalities noted. I anticipated that the first inspection would prove an effectual method for obtaining rapidly a fair introduction to every scholar who was to be examined. No notice was given of the intended visit to any school; indeed, many head teachers preferred such method of procedure, for they feared that certain scholars whom it was specially desirable to examine might absent themselves on the date of the visit, with the special object of evading the examination, notwithstanding their parents' consent. For this reason adjacent schools were not visited in direct succession, and in such schools where at the first visit the

¹ A case occurred at Wakefield Police Court, on October 9, 1907, when a parent was charged under the Births and Deaths Notification Act with falsifying a birth-certificate. The school attendance officer gave evidence that the object was to enable the son to leave school and commence work. The Mayor intimated that, as the case had been brought *only as a warning to others*, the defendant would be merely fined 13s. or fourteen days' imprisonment.

attendance seemed below the average I paid second and even third visits. Especially was this found necessary with infant schools. I took care that the date of my visit to any school should not clash with that of the Diocesan Inspector, nor with that of H.M. Inspector of Schools.

Mode of Examination.—The children, on being given blank cards to take home, were warned that, if they did not wish the teachers to see the information given by their parents, the cards were to be returned under cover. In the course of a week or so these cards were duly returned to the teachers and arranged according to standards. *Not a single card was returned under cover.* On the occasion of my visit the cards were redistributed to the scholars. In the case of mixed schools, boys and girls were examined apart. A woman teacher was always present at the examination of girls. No parent ever asked to be present at an inspection, nor did any school manager ask to be allowed to witness the proceedings. The actual examination was designed to disturb the normal curriculum of a school as little as possible, and therefore was conducted in one room, to which the children came in turn according to standards. Where infant classes formed part of the school, these were examined first. In all cases, however, I enlisted the voluntary services of the most intelligent and robust girls of the upper standards to act as nurse-attendants during the inspection, and, in order to accustom them to the routine of the examination, these girls were examined first of all. They loosened their hair, unfastened their dresses so as to expose the neck, upper part of chest and arms, took off their boots and loosened their garters. They were then arranged in single file and came up card in hand. Skin and other conditions were duly noted, and the usual abbreviations were used designedly to avoid disclosure. The child passed on, card in hand, and was weighed and measured under my supervision, and the record then completed. The child thereupon dressed and returned to her class. The card was handed to a teacher who sat by me, and duplicate entries were made into the medical register.

Later on in the course of the day's proceedings I was able to delegate with safety the weighing and measuring to the teachers. The apparatus for weighing was of simple design—a Salter's balance graded in half-pounds up to 200 lb. It was frequently tested to ensure accuracy.

Boys were similarly examined after discarding jackets, waistcoats and boots, and loosening collars and shirts.

There was no necessity for a child to be absent from its class for more than five minutes, and the average time for individual examination was

two minutes. The first inspection of 6,652 children was completed within sixteen weeks from the commencement. Result of examination:—

TABLE OF WEIGHTS AND MEASURES.

Age (years and months)	Boys		Girls	
	Height (inches)	Weight (lb.)	Height (inches)	Weight (lb.)
3.0	—	—	35.2	29.3
3.1 — 3.6	36	32.9	35.8	31.3
3.7 — 4.0	40	36.4	38.3	33.2
4.1 — 4.6	40.7	37.1	38.4	35.4
4.7 — 5.0	42	38	39.4	36.2
5.1 — 5.6	43.1	40.1	40.2	38.1
5.7 — 6.0	44	40.9	41.6	39.5
6.1 — 6.6	44.5	41.7	42.3	40.1
6.7 — 7.0	45.3	44.7	43.9	43.9
7.1 — 7.6	45.4	46.8	45.6	48.5
7.7 — 8.0	45.5	48.7	45.8	48.8
8.1 — 8.6	46.4	49.2	46.5	49.5
8.7 — 9.0	46.5	50.8	47.7	53
9.1 — 9.6	48.6	54	48.2	53.2
9.7 — 10.0	49.2	55.5	48.5	60.2
10.1 — 10.6	51	59.8	51.3	60.7
10.7 — 11.0	51.4	61.3	52.3	64.4
11.1 — 11.6	51.5	61.8	52.9	65.4
11.7 — 12.0	52.5	65.7	53.2	68.2
12.1 — 12.6	54.1	67.7	54.8	71.1
12.7 — 13.0	54.7	72.2	55.8	79.3
13.1 — 13.6	55.9	76.4	56.9	81.1
13.7 — 14.0	57	77.8	58.3	83.7

Boys weighed and measured without boots, jackets and waistcoats.

Girls weighed and measured without boots.

Vaccination.—The state of vaccination of every child examined was noted. Of the children in the big school, 35.9 per cent. are unvaccinated, while in the infant school the unvaccinated equal 53.6 per cent. The remarkable falling off in vaccination first appears among children born about 1894 and 1895, and continues among those born during the years 1896—1902. Of the children born previous to 1894 between 80 and 90 per cent. are fully protected by vaccination against small-pox. Among the younger children the vaccinated and unvaccinated are fairly evenly distributed. At one school, however, in the immediate neighbourhood of Stroud, while examining the first standard, I met with 20 children in succession, none of whom bore vaccination marks; and again at an infant school in the neighbourhood of Nailsworth, out of 21 boys examined, 18 bore no vaccination marks. None of the four children who were pitted by small-pox had been vaccinated.

TABLE SHOWING STATE OF VACCINATION.

Boys and Girls (Mixed)	On books	EXAMINED		VACCINATION MARKS									
				Nil		One		Two		Three		Four	
		No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
Big School													
Stroud Groups { No. 1	1,770	1,655	93·5	704	42·5	69	4·2	161	9·7	268	16·2	453	27·4
{ No. 2	2,092	1,952	93·3	648	33·2	175	8·9	282	14·4	270	13·9	577	29·6
{ No. 3	1,208	1,109	91·8	340	30·7	64	5·7	111	10·0	190	17·1	404	36·5
Total ...	5,070	4,716	93·0	1,692	35·9	308	6·6	554	11·7	728	15·4	1,434	30·4
Infant School													
Stroud Groups { No. 1	767	656	85·5	389	59·3	54	8·2	64	9·8	83	12·7	66	10·0
{ No. 2	907	783	86·2	413	52·7	70	9·0	48	6·1	94	12·0	158	20·2
{ No. 3	568	493	86·8	233	47·3	21	4·3	48	9·7	85	17·2	106	21·5
Total ...	2,242	1,932	86·1	1,035	53·6	145	7·5	160	8·3	262	13·7	330	16·9
All Schools, Total	7,312	6,648	90·8	2,727	41·0	453	6·8	714	10·7	990	14·9	1,764	26·6

Swimming.—Incidentally, inquiry was made among the big school girls and boys in Stroud and district, at schools which are within easy reach of a watercourse, with the following result :—

Big School (Boys)				No.		Swimmers	
Stonehouse ...	...	...	...	138		2	
Ebley ...	...	...	...	54		2	
Cainscross ...	...	...	...	90			
Whiteshill ...	...	...	...	93		1	
Parliament Street ...	...	...	...	109		4	
Church Street ...	...	...	...	252		11	
Thrupp ...	...	...	...	74		2	
Rodborough Council ...	...	...	...	100		4	
Uplands ...	...	...	...	146		8	
Total	...	...	...	1,056		34 = 3·2 per cent.	

Girls.—Enquiry made among a thousand big school girls. Result : Only one swimmer noted.

FIRST INSPECTION.

Number on books, 7,294 ; examined, 6,652 = 91·2 per cent. Result :—

		No.		Per cent.	
A.—Contagious ¹ :	Ringworm of head ...	86	97	...	1·46
	" body ...	11			
	Pediculosis, live pediculi ...	238	908	...	13·65
	" eggs ...	670			
	Impetigo, body ...	63	80	...	1·20
	" scalp ...	17			
	Scabies ...	...	22	...	0·33
	Inflamed eyelids ...	...	17	...	0·26
	² Scarlatina ...	4	34	...	0·52
	² Acute tonsillitis ...	25			
	² Pertussis ...	1			
	² Varicella ...	1			
Tuberculous discharges ...		3	1,158		17·42

¹ No child appears under more than one heading in connection with contagious skin disease.

² Noted in the routine course of examination.

						No.	Per cent.
<i>B.—Non-contagious:</i>							
Otorrhœa	(foul)	...	...	...	...	16	...
Eczema	...	...	...	...	...	46	...
Seborrhœa	sicca	...	...	...	...	570	8·57
Psoriasis	...	...	...	...	...	7	...
Alopecia	...	...	...	...	...	5	...
Ichthyosis	...	...	...	...	...	6	...
Urticaria	...	...	...	...	...	5	...
						645	9·68

C.—Rheumatic fever, 2; phthisis, 2; heart disease, 6; nephritis, 1; goitre, 9.

COMPARISON OF CONDITIONS FOUND AMONG 1,600 BOYS AND GIRLS, TAKEN ACCORDING TO FAMILIES. (RESULTS IN PERCENTAGES.)

A.—CONTAGIOUS							B.—NON-CONTAGIOUS					
	Thiea	Scabies	Impetigo	Blepharitis	Pediculosis	Total	Eczema	Seborrhœa sicca	Psoriasis	Ichthyosis	Otorrhœa (foul)	Total
Boys ...	1·8	1·7	0·8	0·3	3·1	7·7	1·0	9·0	0·7	0·1	0·0	10·8
Girls ...	1·0	0·1	1·1	0·6	24·5	27·3	0·6	2·6	0·1	0·2	0·4	3·9
Average	1·4	0·9	0·95	0·45	13·8	17·5	0·8	5·8	0·4	0·15	0·2	7·35

TABLE SHOWING FREQUENCY OF SEBORRHŒA SICCA IN URBAN AS COMPARED WITH RURAL SCHOOLS.

Name of District		Stroud School Group	Examined	AFFECTED	
				Number	Per cent.
Stroud Urban	...	No. I.	2,711	103	3·8
Nailsworth Urban	...	No. II.	2,342	242	10·3
Stroud Rural	...	No. II.	1,600	228	14·25
Stroud Rural	...	No. III.			
Total	...	...	6,653	573	8·6

All the spring and well waters of this neighbourhood are hard; those of the upland country in which Stroud Nos. II. and III. school-groups are situate exhibit the maximum amount of hardness (20°—40°). In No. I. group the hardness is about 20°; but by water-softening process this is reduced to 5°.

I recall a few notes made on the occasion of this inspection:—

(1) Children from poor-law institutions, whether boarded out or in the house, were on the average more cleanly than others of a similar station in life; they were better clothed, equally well fed. So was it with boarded-out waifs and strays from London institutions.

(2) Boys and girls disproportionately affected with regard to conditions of scalp and hair.

(a) *Seborrhœa sicca*.—Nearly four times as frequent among boys; due, I consider, to insufficient rinsing and drying of the scalp after soaping with cold water. Many of the well waters of this district are intensely hard, and the hardness is often of a permanent character, so

that it is extremely difficult to obtain a lather, which once formed is not easily removed.

(b) Pediculosis.—Eight times as frequent among girls, due largely to ignorance of parents as to the life-history of *P. capitis*, and in particular the significance of nits. With girls who wear their hair cut short the condition was comparatively rare.

(3) Clothing.—Boots generally too heavy. *Boys'* boots often weigh 5 lb. a pair. I consider this accounts for the trudging gait frequently seen among country school children, for their boots are so clumsy and ill-fitting that free movement of the ankle is often impossible.

Infants generally overclothed, and sometimes a child wears at one time as many as eight layers of assorted garments.

Girls.—Many in the upper standard cannot take part in physical exercise for the following reasons:—

(a) They wear the ill-fitting cast-off corsets of their elder relatives.

(b) Their sleeves are so tight around the armpits that the arm cannot be raised above the head without tearing the dress. In addition the sleeves are so tight-fitting at the wrists that it is quite impossible to wash the arms without undressing.

(4) Children generally well cared for. I could find no evidence of grinding poverty in their appearance.

(5) In nearly every school the prime source of contagion is traceable to one, two, three, and perhaps four families, all of whom have long been known to the head teachers, as to others, as excessively dirty.

Remedial Measures.—From the outset it was recognised that moral suasion was to be the order of the day, and exclusion from school to be employed only in exceptional circumstances. In general no action was taken save in consultation with the head teacher. In the beginning I sent a note to the parent indicating the condition found, and in cases of pediculosis there was enclosed a printed form which described a method for effecting a cure; but this form gave so much offence that its use was almost abandoned. Head teachers, however, kept copies and gave information when asked. In some schools the forms were nailed up on conspicuous sites. At the close of the inspection all cards which bore abbreviations showing special disorders were collected and their owners were called into the room where the inspection had been conducted. Where several members of one family were affected, the most intelligent member alone was interviewed. When children were too young to be trusted with a verbal message a note was sent, *signed always by the medical inspector*. In many instances teachers were personally acquainted

with parents and became the bearers of messages. Only in cases of pediculosis and seborrhœa were remedies directly suggested. Some head teachers, however, urged by parents, applied so often for suggestions as to suitable remedies for other conditions that I was forced to make it plain that suggestions for the treatment of disease formed no part of the experiment. As a compromise, in order to appease all parties and not to jeopardise the scheme, I suggested certain remedies for conditions in general, warning the head teachers that if parents chose to use such remedies for special cases they were acting on the advice of the head teacher.

It appears that some of the abbreviations used on the cards describing the conditions found inadvertently lent themselves to confirming the advice I had tendered the head teachers. Thus:—

Pediculi capitis	...	P.C.	=	Paraffin cure.
Seborrhœa sicca	...	S.S.	=	Soft water and soap.
Tinea tonsurans	...	T.T.	=	Try the tincture (of iodine).
Scabies	...	S.	=	Sulphur ointment and scrubbing with soap.

Children suffering from scabies were forthwith excluded from school; they were informed when they might present themselves for examination for readmission. Those suffering from blepharitis, ringworm, impetigo, and pronounced conditions of pediculosis, whether of scalp or trunk, were isolated at separate desks in school until they could be declared free of infection. They were not allowed to use the school towels. With ringworm the scholar wore continuously a special cap made of light oiled silk, and, as with pediculosis, the outdoor cap or hat was kept at the special desk. With pediculosis, however, parents usually responded with alacrity to the advice given, but relapses were common.

The effect of such methods as applied to Nailsworth and Stroud groups of schools may be seen in the following table:—

Number of schools, 38; scholars, 5,062; all examined.

Conditions	NUMBER FOUND AFFECTED						Improvement per cent.
	August to December, 1904			January to May, 1905			
Tinea	90	=	1·8 per cent.	25	=	0·5 per cent.	72
Pediculosis (Pediculi)	198	706	= 14·0 ,,	94	361	= 7·2 ,,	49
(Ova)	508			267			
Impetigo	65	=	1·3 ,,	26	=	0·5 ,,	60
Scabies	19			1			94
Blepharitis ...	15			5			66
Total Contagious	895	=	17·9 per cent.	418	=	8·4 per cent.	53·4
Icthyosis	8			8			Nil
Alopecia	4			3			25
Psoriasis	7			3			57
Seborrhœa sicca ...	369	=	7·4 per cent.	166	=	3·3 per cent.	55
Eczema	40			20			50
Foul otorrhœa ...	7			9			—
Grand Total	1,330	=	26·0 per cent.	627	=	12·5 per cent.	52·9

Tuberculosis and Consumption.—Inquiry was made as to the presence of these forms of disease in the immediate family or household. In general, 4·2 per cent. of the replies are in the affirmative, but I have reason to believe that the actual number affected is not less than 6 per cent.

PRESENCE OF CONSUMPTION OR TUBERCULOSIS IN FAMILY.

Big School children.				POSITIVE REPLIES	
				On books	
				Number	Per cent.
Stroud Groups ...	No. 1 ...	1,770	90	5·1	
	No. 2 ...	2,092	79	3·8	
	No. 3 ...	1,208	63	5·2	
Total ...				5,070	232
					4·6
Infant School children.					
Stroud Groups ...	No. 1 ...	767	39	5·1	
	No. 2 ...	907	19	2·1	
	No. 3 ...	568	28	5·0	
Total ...				2,242	86
					3·8
All Schools total ...				7,812	323
					4·2

Vision.—The following table relates to the examination conducted among the schools of the Stroud No. 1 group; 1,131 children, including most of the upper standards, were examined during school hours by means of test types and ophthalmoscope. Of this number 22·3 per cent. proved to have defective eyesight and 5 per cent. undoubtedly require spectacles.

VISION SUMMARY. RESULT OF EXAMINATION.

Big school				Number examined	Defective vision
Parliament Street ...	...	...	...	191	36
Castle Street, girls	...	...	...	256	78
Church Street, boys	...	...	...	200	50
Thrupp ...	...	...	...	155	22
Rodborough Council	...	...	...	100	23
Uplands ...	...	...	...	229	43
Total ...				1131	252 = 22·3 per cent.

Zymotic Disease.—In general, the information obtained relates to children born during the years 1891-1902. The period covered by the information relating to the incidence of zymotic disease is that of 1891 to 1904. Throughout the district boys and girls are evenly distributed, their numbers being approximately equal. The testimony of the parents (stated in terms of per ten thousand children) is to be seen in table Z.

TABLE Z. SHOWING AGE-INCIDENCE OF CERTAIN DISEASES PER TEN THOUSAND CHILDREN IN INFANT SCHOOLS AND BIG SCHOOLS RESPECTIVELY.

Disease	School or Department	Under 1 year	AGE IN YEARS. NO. OF CHILDREN AFFECTED AT AGES :													NUMBER AFFECTED				
			1	2	3	4	5	6	7	8	9	10	11	12	13	Before school age, under 3	At school age			Total
																	Infant school 3-6	Big school 7-13	Total 3-13	
Scarlatina ...	(Infant Big school	13 8 18 34	102 116 76 104	67 18 164 218	182 128 94 60	26 8 4 4	— —	— —	— —	— —	— —	— —	— —	— —	123 201 128 668	— —	— 320	201 988 668 1,116	324 1,116	
Diphtheria ...	(Infant Big school	4 — 2 2	— 31 12 14	27 30 62 31	36 38 31 31	8 8 70 64	18 56 40 42	22 2 28 36	— —	— —	— —	— —	— —	— —	4 16 16 118	4 —	— 130	66 248 118 264	70 264	
Quinsy ...	(Infant Big school	4 — 8 6	— 8 12 20	49 26 26 42	62 31 42 60	31 8 70 64	40 42	28 36	— —	— —	— —	— —	— —	— —	12 26 173 428	8 —	— 280	181 454 148 454	193 454	
Croup ...	(Infant Big school	13 26 18 28	71 31 34 44	44 36 44 36	8 27 38 30	16 12 8 14	2 2	— —	— —	— —	— —	— —	— —	— —	110 80 148 148	— —	— 52	110 220 148 280	220 280	
Rheumatic fever ...	(Infant Big school	— — — —	— 2 2 2	4 4 4 4	8 14 16 10	10 12 8 4	— —	— —	— —	— —	— —	— —	— —	— —	— 16 28 28	— —	— 74	16 102 28 104	16 104	
St. Vitus' dance ...	(Infant Big school	— — — —	— — — —	— — — —	— 6 6 6	2 2 10 12	12 2 8 2	— —	— —	— —	— —	— —	— —	— —	— 4 12 12	— —	— 48	— 60 12 60	4 60	
Whooping-cough ...	(Infant Big school	151 160 164 292	649 813 450 574	653 500 500 500	484 446 320 260	227 148 40 102	50 24 12 10	— —	— —	— —	— —	— —	— —	— —	960 906 2,177 1,840	40 —	— 606	2,217 3,177 1,840 3,352	3,177 3,352	
Measles ...	(Infant Big school	236 853 110 240	1,004 911 588 794	991 1,020 1,116 954	156 107 684 510	8 380 158 42	6 2	— —	— —	— —	— —	— —	— —	— —	2,093 938 1,573 3,874	8 —	— 1,732	1,581 3,674 3,874 5,606	3,674 5,606	
Mumps ...	(Infant Big school	4 80 4 30	133 218 72 170	289 208 342 370	107 252 67 312	13 306 272 156	88 36	— —	— —	— —	— —	— —	— —	— —	217 106 681 942	13 —	— 1,028	691 1,970 942 2,076	911 2,076	
Chicken-pox ...	(Infant Big school	102 258 40 138	382 427 294 334	427 370 334 258	204 334 160 114	72 38 10 4	— —	— —	— —	— —	— —	— —	— —	— —	742 472 1,044 1,296	— —	— 398	1,044 1,786 1,296 2,166	1,786 2,166	
Small-pox ...	(Infant Big school	— — 2 —	— 2 2 —	— — — —	— 2 2 —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— 4 4 4	— —	— —	— 4 4 6	4 6	

The changes in age and sex incidence both before and during school life (1891-1904) are as follow :—

Scarlatina.—There has been slight reduction before school age, 128 to 123, and a great reduction in the infant school, 668 to 201. The maximal age-period incidence for children in the big school was from 3 to 7, *i.e.*, during the whole of the time they were in the infant school as well as the first standard of the big school. For children in the infant school this age incidence has changed to an earlier period, *viz.*, 2 to 4, *i.e.*, for the year preceding school life and the first two years of school life. Boys and girls are affected disproportionately both before and during school life, the girls being always in excess. The numbers are as follow :—

SEX INCIDENCE.					
Before school life	...	Boys	96	...	Girls 135
During „ „	...	„	650	...	„ 831
Total, age 0-13		„	746	...	„ 966

Diphtheria.—There has been much reduction before school age, 16 to 4, and similarly in the infant school, 118 to 62. For big school children the maximal age-period incidence is from 4 to 10, *i.e.*, during the major portion of infant school life as well as for the period covered by the first four standards. For infant school children the maximal incidence has receded to the third and fourth years of life, *i.e.*, during the first two years of school life. Boys and girls are affected as follow :—

Before school life	...	Boys	11·5	...	Girls 19
During „ „	...	„	246	...	„ 207
Total, age 0-13		„	257·5	..	„ 226

Quinsy.—Diminution before school age, 26 to 12, and an increase in the infant school, 148 to 173. There is little variation in the disease during school life, save that the maximal incidence has changed from the seventh year of life for children in the big school to the fourth year for infant school children.

SEX INCIDENCE.					
Before school life	...	Boys	30·7	...	Girls 7·6
During „ „	...	„	338	...	„ 442
Total, age 0-13		„	368·7	...	„ 449·6

Croup.—Increases before school age, 80 to 110. Diminishes in infant school, 148 to 110. For big school children maximal age incidence period is from 1 to 6, likewise with infant school children.

SEX INCIDENCE.					
Before school life	...	Boys	100	...	Girls 85
During „ „	...	„	254	...	„ 135
Total, age 0-13		„	354	...	„ 220

Rheumatic fever and St. Vitus' dance have been included within the scope of the enquiry in order to determine their epidemiological relationship, if any, with other diseases.

Rheumatic Fever.—The incidence before school age is negligible. Only one case is reported among big school children as having occurred previous to school age. None are so reported from among the infants. The change is as follows; In the infant school, diminution from 28 to 16. The incidence in the big school is fairly evenly distributed over ages from 5 to 11.

SEX INCIDENCE.

At school age (3-13)	...	Boys 42	...	Girls 112
----------------------	-----	---------	-----	-----------

St. Vitus' Dance.—No cases before school age. Diminution in the infant school, 12 to 4. Incidence is, in the big school, at ages 5 to 12.

SEX INCIDENCE.

At school age (3-13)	...	Boys 27	...	Girls 65
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Thus there is some parallel between rheumatic fever and St. Vitus' dance as touching age and sex incidence. The relationship between rheumatic fever and quinsy, however, appears to be somewhat remote.

Whooping cough.—Increases before school age from 906 to 960, as well as during infant school life, 1,840 to 2,177. The maximal age-period incidence is during the first eight years of life, and the year of maximum incidence, both for infant school and big school children, is the third.

SEX INCIDENCE.

Before school	...	Boys 869	...	Girls 938
At school	...	„ 2,388	...	„ 2,723
Total, age 0-13	„	3,257	...	„ 3,661

Measles.—Great increase before school age from 938 to 2,093, and diminution in the infant school from 3,874 to 1,573. The years of maximal age incidence in the infant school are at 1, 2 and 3, while for big school children the years were 4, 5 and 6. Thus the period of maximal age incidence has changed by about two years.

SEX INCIDENCE.

Before school	...	Boys 1,196	...	Girls 1,119
At school	...	„ 4,542	...	„ 4,685
Total, age 0-13	„	5,738	...	„ 5,804

Mumps.—Increases before school age, 106 to 217; diminishes in the infant school, 942 to 681. For big school children period of maximal age incidence is from 2 to 11; year of maximal incidence is at 6. For

infant school children period is from 1 onwards; year of maximal incidence is at 4. Thus the period has changed by about one to two years.

SEX INCIDENCE.					
Before school age	...	Boys	176	...	Girls 143
At	„	„	1,585	...	„ 1,619
Total, age 0-13		„	1,761	...	„ 1,762

Chicken-pox.—Increases before school age, 472 to 742, and diminishes in the infant school 1,296 to 1,044. For big school children, period of maximal incidence is from 2 to 8, and year of maximal incidence is the fourth. For the infant school the period is 1 to 6, and the year is the third. Thus the period has changed by one year.

SEX INCIDENCE.					
Before school age	...	Boys	562	...	Girls 573
At	„	„	1,354	...	„ 1,692
Total, age 0-13		„	1,916	...	„ 2,265

SECOND ATTACKS.

Measles.—Of 4,287 cases, 26 instances reported (1 in 172). Average interval between first and second attack = 3·6 years.

Instances.	Interval in years.
2	7
4	6
3	5
5	3
10	2
2	1

Age of attack in each instance $\left(\frac{\text{Numerator}}{\text{Denominator}} = \frac{\text{age of 2nd attack}}{\text{age of 1st attack}} \right)$:— $\frac{1}{1}$ (two), $\frac{2}{1}$, $\frac{2}{2}$, $\frac{3}{1}$ (three), $\frac{3}{2}$ (two), $\frac{3}{3}$, $\frac{3}{4}$, $\frac{3}{5}$, $\frac{4}{1}$ (two), $\frac{4}{2}$ (three), $\frac{4}{3}$, $\frac{4}{4}$, $\frac{4}{5}$ (two), $\frac{5}{1}$ (two), $\frac{5}{2}$, $\frac{5}{3}$, $\frac{5}{4}$, $\frac{5}{5}$ (two), $\frac{6}{1}$.

One instance of a *third attack*.

Age of attack : 3, 6 and 10 respectively.

Whooping Cough.—Of 2,559 cases, 2 instances (1 in 1,280) at five-yearly intervals.

Age of attack : $\frac{5}{1}$ (both).

Scarlet Fever.—Of 706 cases, 4 instances (1 in 177); average interval = 4·2 years.

Age of attack : $\frac{4}{1}$, $\frac{5}{2}$, $\frac{6}{3}$, $\frac{7}{4}$.

Chicken-pox.—Of 1,555 cases, 1 instance.

Age of attack : $\frac{1}{1}$.

Mumps.—Of 1,279 cases, 4 instances (1 in 320); average interval = 3 years.

Age of attack : $\frac{4}{1}$, $\frac{5}{2}$, $\frac{6}{3}$, $\frac{7}{4}$.

Review.—It is clear that in the matter of medical supervision of schools the schoolmaster must be regarded as the doctor's lay coadjutor, and further, that an organised system of medical inspection must be comprehensive and sufficiently elastic to cope with individual requirements. In this Stroud district of Gloucestershire, despite the absence of all definite powers, almost every parent at the outset gave his adhesion to the proposed scheme. Yet it must be borne in mind that the parent held the master-key of the situation, for the law was clear on the subject that no man need carry out medical treatment. Medical supervision is a comprehensive expression, and two spheres are all-important: the control of contagious and zymotic disease and the adaptation of the school task to the individual scholar's capacities. Whatever measure of success attended this inspection for contagious skin disease was due to the recognition of the principle of a separate desk for each affected scholar, with the corollary of isolation of his belongings while in the school. At the same time it was recognised that as one-seventh of the child's school life was spent under the school roof, it was equally important to pursue the system beyond the school gate.

The institution of the medical register facilitated the control of certain forms of zymotic disease, notably with measles, for the columns revealed at a glance the amount of inflammable material existing in any household, standard, school or area. The unwisdom of general school closure when only a certain proportion of children was likely to be affected was made plain; more especially did it seem inexplicable that the precious school hours of children in the upper standards, preparing, perhaps, for competitive scholarship examination, should be wasted by school closure for considerable periods because an epidemic raged among children in the infant classes. The task of controlling zymotic disease among children in infant classes will be simplified when parents are compelled to disclose a reason for the child's absence from school when once its name is on the school register. At present, with children under 5, no such explanation as to absence is asked for or furnished. Curiously enough, a similar condition seems to prevail with children of all ages from poor-law institutions attending public elementary schools. It is plain that with scarlatina and diphtheria the gregarious habits of children must be taken into account, and complete inspection of households should accompany inspection of the affected school, for a child's playmates are usually to be found at its day school.

The adaptation of the school task to the individual scholar's capacities means in effect a recognition of defects of the special senses, as well


as the limitations of his general intelligence. The head teacher will need some guidance to distinguish defects of the special senses from pure inattentiveness, and to learn that the curious high-pitched reading voice may be a sign of deafness, as may be the omission of words in taking down dictation; further, that a child's backwardness in geography may be due to inability to follow the teacher's map pointer; and finally, that with observation a lesson in sight-singing, by the simple tonic sol-fa system, may be utilised as a means of confirming all suspicions as to defects of sight or of hearing. The practical school remedy for those defective in the special senses will consist in the application of the empirical principle of "the front row," so that the defective child shall be nearest to the teacher.

The difficulties attending the inception of this pioneer scheme are happily dispelled by the recent changes in legislation. Objection was raised and sustained during the course of this inspection that if it were necessary to examine every child medically Stroud had no special claims to be so singled out from all other areas; that in effect the medical inspector was a universal requirement.

No.

MEDICAL HISTORY CARD.

[Boys.]¹

 If the Parents will kindly answer these questions, and fill up particulars on this side of the Card, it will be of great assistance in preserving the health of their children. THE INFORMATION ASKED FOR WILL BE REGARDED AS STRICTLY PRIVATE, and is for the use of the Medical Inspector only.

Name of Child..... Date of Birth.....

Address.....

Day School..... Sunday School.....

Number of Children in Family { 14 years of age and under.....
15 " " and over.....

Is there any Consumption or Tuberculosis in the Family?

Kindly say at what age the Child has had any of the following Illnesses, and please write the age under the Illness suffered, if any :—

Scarlatina or Scarlet Fever	Measles	Chicken- pox	Diph- theria	Mumps	Whoop- ing-cough	Croup	Quinsy or Ulcerated Sore Throat or Acute Tonsillitis	Rheu- matic Fever or Acute Rheu- matism	St. Vitus' Dance	Small-pox
At the age of	At the age of	At the age of	At the age of	At the age of	At the age of	At the age of	At the age of	At the age of	At the age of	At the age of

Does the child enjoy good health generally?..... Parent's Signature.....

Remarks by Parent Occupation.....

..... Date.....190

¹ Boy's card, white. Girl's card, pink.

This side of the Card is reserved for the use of the Medical Inspector of Schools.
Please do not write on it.

[illegible]

DISCUSSION.

The CHAIRMAN said members were greatly indebted to Dr. Coplans for his interesting paper, which contained many points inviting serious discussion. Dr. Martin, in whose county the inspection described took place, was unable to be present, but he had sent a letter, which would be read. It had been his intention to ask Dr. Martin to open the discussion.

The SECRETARY then read the following letter:—

DEAR DR. HAMER,—Very many thanks for your letter and the proof of Dr. Coplans' paper, which I have read. You will find an account of the origin of our experimental scheme printed with the evidence which I gave before the Inter-Departmental Committee on the Medical Inspection and Feeding of Children attending Public Elementary Schools, beginning on page 134 of the second volume of their report. You will also find some observations of the Committee on our scheme in the first volume. You will notice that this does not quite agree with Dr. Coplans' introduction. The main point in the paper as it now stands appears to me to be contained in the section, "Zymotic Diseases." It seems to me that the effect of introduction of infectious diseases into homes *through school influence* is entirely omitted, and, speaking generally, it is from schools that infectious disease appears in the homes. With regard to the footnote to the table on page 5, too much stress should not be laid on the hardness of the water; that supplied to the Stroud Urban District is very hard, while in any of the parishes in Group II. (Stroud Rural) are supplied by the Stroud Water Company, who soften their water down to 6° or 7°.

With kind regards, and many thanks for sending me the paper,

Yours very truly,

(Signed) J. MIDDLETON MARTIN.

Dr. SANDILANDS (Winchester) said he had listened to the paper with great interest, and it contained so many points that it was difficult to know which to pick out for discussion. He did not think, however, that some of the matters touched upon were directly connected with medical inspection of schools, at least, not so closely connected as they might be. For instance, vaccination seemed to be a matter into which a medical inspector of school children need not enter, because the matter had been so thoroughly dealt with under the system devised by the Local Government Board. A similar remark applied to notifiable infectious diseases. Those diseases came within the provinces of medical officers of health, who had better information, and must have by the terms of their appointment, their facilities being greater than that of a medical man, who could only go into the schools and acquire information from the children there. With regard to eyesight, he noticed that 22 per cent. of the children were reported as defective. He would like to know what the standard of eyesight was; was anything below six-sixths regarded as defective, or was some lower standard taken? He thought six-sixths unnecessarily severe. He would also like more information as to the degree of success which had attended getting those children treated after notices had been sent to their parents pointing out the defects. He had carried on that work in Winchester during the last seven or eight months, and had just made his second visit to the schools to ascertain what number of parents, to whom such notices had been sent, had taken their children for medical advice. He was astonished at the great number who had so responded. One result of that was that there was over-work in the eye department of the County Hospital, and the surgeon there found himself unable to deal with all the cases sent. That point would have to be seriously considered in the near future. If the inspection must be done throughout the country it would be impossible to carry it on without the appointment of at least eye-specialists, if not specialists for other defects also.

Dr. H. MEREDITH RICHARDS (Croydon) said that at a time like the present when the new Education Amendment Act was about to come into force, members must be very much indebted to anyone who would take the trouble to bring before the Society such a paper giving the results of practical experience in school inspection. As he had not seen the paper until he entered the room he would content himself with a few discursive remarks. He agreed with Dr. Coplans that it was essential that at any rate administrative medical inspection should be in the hands of a special officer. That did not necessarily imply that treatment must be undertaken by the school doctor, but he was sure the medical inspection should be the work of a medical officer directly responsible to the education authority.

He thought the difficulty with the parents was more imaginary than real. The difficulty in Croydon had rather been the other way about, in that they were invaded by parents who wanted advice on all questions, and therefore it became a question rather of limiting the advice given than putting stress or pressure upon parents to seek the doctor. He agreed that it was of no use undertaking medical inspection unless one was able to see that remedial

measures were undertaken by the parents. It was not sufficient to go to the schools and make a catalogue of the bodily and mental defects ; there should be some means whereby treatment could be secured, not necessarily undertaken by the education authorities. The method which he had adopted in Croydon during the last few years was to co-ordinate the work with the work of the health department, and, after medical inspection, to send a written notice to the parents of the child in whom there was a defect, and give a similar notice of the defect to the health officer of the district, who kept the case under observation until the defect was remedied, otherwise most of the work was thrown away. Reference had been made to the necessity of getting the parents' consent. The method adopted in Croydon was to prepare a card, one side of which was devoted to the history of the patient ; the cards were given to the health officers for the district, and they called at the homes of the children, obtained the histories, informed the parents that the doctor proposed to examine the children on a certain day, and that if they liked the parents could be present. It was not found that the scholars absented themselves on those occasions—not one in a thousand.

Dr. Coplans seemed to have adopted the system of first of all examining the child and then measuring him. At Croydon one of the nurses went to the school about twenty minutes before the arrival of the medical inspector and weighed and measured the children, and the cards were handed to the medical inspector, with the weights and measures attached. Then a British Association standard table of weights and measures was referred to, and if any child was obviously below that standard a more searching examination was made.

He had often been asked how long the examination took. The experience in Croydon, after several experiments, was that about twenty-five children at a sitting, lasting about two hours, was as much as could be conveniently done. Also that was about the greatest time which could be conveniently fitted into a morning or afternoon session. The number would depend on the amount of assistance which could be asked for from the authorities. A guide in that matter was not only the number of examinations which could be got through in a stated time, but the number of children who could be examined with advantage. All who had held hospital appointments must know that after a certain time in out-patient departments the value of the work done diminished, because the faculties were tired. He could not very well criticise the percentages given on page 51 of the paper without reference to his own figures, which he had not by him, but he was struck by the small proportion of cases of pediculosis in the Stroud school. In the Croydon schools three or four years ago it was found that more than half the girls and nearly half the boys were affected with pediculosis, so he was surprised that the percentage at Stroud was only $13\frac{1}{2}$.

With regard to the treatment of some of the diseases, in Croydon they had followed the good example of the London County Council, and in respect of pediculosis they had been content to use a modification of the cards designed by Dr. Kerr, and if that was not effectual, to follow the cases up

by prosecution, either directly or by getting the Society for the Prevention of Cruelty to Children to prosecute. With regard to tuberculosis in schools he had not his own figures, but he thought the proper way to deal with the disease in schools was to get a careful history of phthisis in the family, and then regard all children with a family history of the disease as children for special inspection. That would mean that they would be very much more frequently examined, and any changes carefully noted.

He could scarcely follow the figures in regard to the incidence of various diseases among school children, but in regard to measles, mentioned on page 58, it seemed curious that the age incidence was greatest in infant school children at one, two, and three years of age, while for the big school children the years were four, five, and six. Was not the explanation a simple one? Did it not mean that there was an outbreak of measles in that district three years previously, and that at the same time it affected the children of four, five, and six, and those of one, two, and three? In towns one did not find the same result, because in towns measles was present every other year, and its exacerbations were obscured by almost continued prevalence. It was interesting to see second attacks of measles were very uncommon, and that showed that the history given as to past measles was fairly reliable. At one school he got out the number of children who were said to have had measles during previous epidemics. When measles occurred again it was found that scarcely any of those children suffered, showing that the history given had been reliable. The same thing was borne out in the paper on page 59. He must also mention a remark from which he dissented, namely, that "no man need carry out medical treatment." He, Dr. Richards, thought that every parent was responsible for the due care of his children, and if he so treated them as to subject them to unnecessary harm or suffering, it was a clear case for prosecution, and at Croydon there had been no difficulty in occasionally getting convictions in the local courts. He agreed with the author as to the unwisdom of school closure, and he believed it was also unwise to exclude from schools children who had already suffered from measles or whooping-cough. Many towns did not exclude from school older children who had already suffered from measles and whooping-cough. That had been so at Brighton for many years, and also at Croydon, without ill effect. In regard to the remarks on page 61, he asked the author whether he had had much experience of the more obscure mental conditions of children. In Croydon there had been a number of cases of word-blindness and word-deafness. Such children needed not only to be put in the first row, but to be placed under very special conditions. On the previous day he saw a word-deaf child, who could hear ordinary noises, but who did not understand more than three words in the English language, yet the child was not an imbecile. It made strong efforts to speak and to understand what was meant by watching the speaker's face. Such a child would rightly be sent to the Deaf Centre, even though it were not a deaf child, and it would be taught orally, and would probably gain a good deal of power of speech. He would have liked to have discussed the schedule at the end, but he had already

spoken too long. He thought that what Dr. Sandilands said about the medical officer of health having more information about infectious diseases emphasised the importance of co-ordinating work. And the remark about the over-work in the eye department of the hospital emphasised the need for the educational authorities undertaking treatment, at least as far as the provision of glasses was concerned.

Lieut.-Colonel MACPHERSON, R.A.M.C., endorsed what had already been said as to the great interest of the paper, which threw considerable light on the spread of epidemic and contagious diseases through the country. The two points which struck him most had already been commented upon. The first was the deplorable state of vaccination among children of the schools, and the other was the very high percentage of children having defects of vision. The facts brought out by the paper in regard to vaccination were very important, and threw much light on the incidence of small-pox in England as compared with that of other countries. Some time ago he saw a map of Europe prepared by the Prussian Institute of Public Health, indicating the prevalence of small-pox, and he found that England showed an incidence about equal to the less enlightened Balkan States, and was very much behind that of most other European countries. That fact should be brought to the notice of the British Government. It would have been interesting to hear what particular visual defect was noticed in the children. Probably only a small percentage of them were due to myopia. Perhaps the author would say something more about that in his reply.

Dr. BUTLER (Willesden) said the results of Dr. Coplans' enquiries were very interesting, and he believed they agreed closely with those of others who had inspected school children. Much of the work set forth was not of epidemiological interest: much of it raised administrative problems which were not suitable for discussion there, and the field for discussion in the paper was, therefore, somewhat limited. One of the most interesting points, from the epidemiological aspect, was the relationship between measles, whooping-cough, and other non-notifiable infectious diseases and school attendance. His experience had been that those diseases did bear a most intimate relationship to attendance at school. In his district he had found that by far the greater proportion of cases of measles and whooping-cough were school-spread; he believed it was two-thirds. It was a significant fact, and the measures to be taken with regard to it raised problems which had been dealt with by the author. He did not agree that school closure was useless in checking the spread, more particularly of measles. He did not believe that measles could be combated except by means of school closure. He had attempted class closure, but with signal failure. It usually ended in cases escaping exclusion and other classes being infected, and in the end giving rise to worse results than if the school had been closed. If the measures were to be effective it was necessary that there should be early intimation of the occurrence of cases in the class, and the closure must be prompt and cover the period at which the next crop ought to be anticipated. He believed that it was only in the infants' department

that the disease spread. He had repeatedly closed an infants' school on the occurrence of even a first case, though class closure was often sufficient there. It often only meant a week's closure, and a threatened epidemic had been nipped in the bud by such a procedure; moreover, the effect with regard to saving of school time was economical. He had made the experiment so frequently that he was satisfied, if early intimation was obtained, the next crop could be anticipated. If one waited until the third or fourth crop of a disease was established it was hopeless to expect to check it, because by that time it had practically used up all the available material. Class closure, as against school closure, had the defect that one might overlook the occurrence of another case in another class, and then the time of the class had been wasted by the closure. There were administrative considerations which prevented one from dealing with measles and whooping-cough on the ground that a previous attack conferred immunity. He was satisfied that a previous attack conferred immunity, and that there was no necessity to exclude children who had had a previous attack from school. But those formed a comparatively small proportion in an infants' department, and to open a school for their reception was not practicable. With regard to eyesight he believed it should be based not upon the standard of six-sixths, but upon that of six-twelfths. Out of 20,000 tests of vision in school children, about 20 per cent. had, in the older departments, a vision of six-twelfths or below. If the children with defective eyesight were sent to the hospitals, the medical officer in charge began to complain of overwork. And yet there was no escape from it. Children whose vision fell below the normal ought to have their eyes examined by an ophthalmic surgeon, and when one considered the serious disabilities which followed upon defective vision which was left uncorrected, the importance of this was quite apparent.

Dr. HAMER said that a point which was of great interest to him was that made by Dr. Coplans concerning the difficulty of being sure as to the precise age of school children. This difficulty made it the more necessary to be continually on the look-out for mere tricks of the figures. The greater part, if not the whole, of the supposed increase of cancer, and some portion of the recorded diminution of phthisis, were of course known to be the result of altered nomenclature. Again, a mere trick of the figures, so to speak, was responsible for the supposed failure on the part of infant mortality to show decline, corresponding to the fall in the general death-rate, the failure being accounted for by the improved registration of the deaths of very young children. This was indeed obvious, having in view the fact that dissection of the figures relating to deaths under one year of age showed improvement had occurred all along the line save in the case of newly-born children. It was most desirable that in connection with educational statistics the same kind of mistake should not be repeated. It was essential the correct ages of the children should be known, otherwise nice deductions based upon small differences observed in the heights and weights at different ages were beside the mark.

As Dr. Richards had pointed out, the explanation of the table showing the behaviour of measles was, no doubt, that an epidemic occurred about four years before the date of Dr. Coplans' enquiry. The same might be said about scarlet

fever, diphtheria and croup, all those sets of figures running the same way. The children in the big schools were comparatively exempt, and in the infants' schools the children of four, five, six, and seven were exempt. So that in the case of those diseases the explanation, in the main, was that epidemics of measles, diphtheria, and scarlet fever occurred in the year 1900. But he was at first puzzled by the behaviour of the whooping-cough figures, because the heavy incidence upon the later ages in the big school made it apparent that there must have been a recent prevalence of whooping-cough in Stroud. This conclusion was borne out by the figures in infants' schools. What was puzzling was the very heavy incidence of the disease at ages from two to seven on children in the big school; this seemed to suggest that an epidemic prevalence must have occurred some seven years prior to Dr. Coplans' inspection. Reference to the Registrar-General's returns showed the explanation was that there was an epidemic of whooping-cough in 1897, and then comparative freedom up to 1904.

The most comforting observation in the paper was that in which the author pointed out that the prime source of contagion was, as a rule, traceable to two or three families, all of whom had long been known to the head teachers as excessively dirty. He thought a fact of that kind was most hopeful concerning the results likely to accrue from school inspection.

The CHAIRMAN said Dr. Hamer was very pessimistic with regard to statistical returns, but he admitted that there was a ray of hope in the paper. Personally, he, Dr. Bulstrode, thought there was great hopefulness in the paper. Notwithstanding Acts of Parliament no measure could be enforced upon the people, as was shown by the measure of compulsory vaccination. The paper showed that 97 per cent. of the parents consented to the medical inspection, even in the Stroud Valley district, noted for being the home of a stiff-necked people. Therefore the enquiry was very hopeful for the rest of the country. The remarks made by Colonel Macpherson in regard to vaccination were quite true, but in the annual reports of the Local Government Board there were figures which enabled them to practically predict what would be the behaviour of small-pox all over the country in the event of a pandemic. Assuming a wave of equal magnitude, and resistance the same all over the country, they could predict where the disease would behave in a natural fashion, and where it would behave in an artificial fashion. In the Stroud Valley it would behave in a natural fashion in infants, while on a well-vaccinated community it would behave artificially, and the incidence of the disease would be on adults.

Another hopeful point was that the general sanitary condition of the poor law schools was better than that of others. That would be seized upon by a certain class of political agitators as an argument for the State education and protection of children. He thought that tuberculosis in schools had practically not yet been touched. So far as could be gathered from the post-mortem records in this country and France, the incidence of tuberculosis upon the age group which went to school was considerable. But it appeared that the tuberculosis was not of a dangerous and communicable nature. Still the book was scarcely open with regard to the prevalence of tuberculosis in children. Dr. Coplans'

remark in regard to *seborrhœa sicca* and its relation to the hardness of water was very interesting, and suggested the possibility of applying a new means of testing for hard waters.

Dr. BUCHANAN said he had no special knowledge of inspection of schools, and he would only draw attention to one or two points which occurred to him on hearing the paper. One was an administrative point, and therefore was not one which strictly concerned the Section. But he gathered that when Dr. Coplans was in a difficulty with the head teachers, who wanted some suitable remedy for the condition of the children's heads, he suggested as a compromise that he would advocate certain remedies, warning the head teachers that if the parents chose to use such remedies for special cases they were acting on the advice of the head teacher. He (Dr. Buchanan) did not think that was very sound administration, in the absence of special reasons. Either treatment should be recommended and the responsibility taken, or it should not be recommended.

Dr. Hamer had touched on the conclusions to be drawn from Table Z. He also had noticed that, and thought the occurrence of an epidemic at particular times would account for the apparent distribution of the periods at which the particular diseases appeared to especially fall. But another point the Section was interested in was as to how Table Z was compiled. Perhaps the author would say how he reckoned the cases so as to get the proportion per 10,000 children? He believed it was that he had originally 7,000 children, divided into 5,000 in the big schools and 2,000 in the infants, and he sent round so many cards to the parents to fill up the ages at which those children had had scarlet fever, &c. In order to arrive at the figures he had brought the 5,000 children in the big schools to 10,000, and the 2,000 in the infants' to 10,000 also. That would be quite right for children of thirteen because parents could say what had happened to the child up to that age; but at seven the parents could only say what had happened up to that age, and at three up to that age, and so forth. And as a matter of fact the cards, dealing with ages such as eleven to thirteen were quite a minority.

So it seemed dangerous to draw from those figures an inference as to what were the particular ages, from one to thirteen, at which scarlet fever, &c., showed the highest incidence.

Dr. COPLANS, in reply, said that what he had put forward was intended to be the nucleus of a scheme capable of easy expansion. It had taken him less than a year to carry out. The investigation into eyesight was the last carried out, for the conditions prevailing in the country were not very favourable, and there existed a tendency to regard this form of inspection as interfering unduly with the school time. He had been told that if the scheme was successful it would be extended in all directions, and that more medical men would be appointed to carry out examinations of special senses. He had merely brought to light the result of a cursory examination. The work of medical inspection of school children proved extremely laborious, and he had no assistance of any sort. If the Croydon average of twenty-five children every two hours were taken, he did not know when the doctor would complete the examination of

8,000 children—the school year would be insufficient. It was customary for him to examine 150 children per day. That had an interesting reference to the remark of Dr. Kelynack at Liverpool, with regard to tuberculosis in children: That physician said that five minutes spent on examination of a child was not sufficient to reveal the presence of lung tuberculosis; moreover, it required a clinician of much experience to detect that form of disease in children. In regard to eyesight standard, he thought the right test was whether the child could see the board writing from any part of the class. He did not set up a six-sixths standard. His own view concerning the scholar was that anything below six-sixths was defective. In the 25 per cent. of defectives he included those who had eye injuries, corneal and other opacities. Five per cent. of the children required spectacles. His examination was necessarily curtailed because of the exigencies of time. With regard to vaccination he thought it well to have information concerning any particular school, for epidemiologically it might prove of importance to know the state of vaccination in any isolated area, however small. The Local Government Board statistics would not help in such cases. The parents did not show anxiety to seek advice until confidence had been established. The people of Gloucestershire were of repute cantankerous and suspicious, and some felt that his examination might prove the thin end of the compulsory vaccination wedge. But when they saw from the cards distributed that the scheme was private, and the contents of the card would not be disclosed to a third person, full confidence followed. That was a reply to the remarks of Dr. Meredith Richards as to the nurse calling at the house. Such a step would have involved a breach of confidence, for he could not lay any information before any third person, even a magistrate. As to drug treatment of children, the law remained unchanged; the parent was the final arbiter, and the decisions of the Croydon justices should have been reversed. With regard to the closure of schools for measles, children under 5, formed 10 per cent. of the total school population, and 30 per cent. to 50 per cent. of those in infants' schools. Fourteen per cent. of the children under 5 in infants' schools were always away, and that was the clue to the mystery as to the alleged sudden outbreaks of measles. The fact was that when an outbreak occurred cases had been going on for some little time. When 14 per cent. were away, it was difficult to control measles epidemics, because the medical officer was usually called in too late. In one district there had been no visitation of measles for ten years, and when at last it came, the school was attacked even up to the fifth standard. As usual, he was notified after the event. Too many conclusions should not be drawn from town experience; each epidemic should be judged separately. He laid much stress on table Z, though it gave simply the facts as told by the parents. It showed that in general the statements of the scholars' parents were extremely reliable. Dr. Butler had stated that financial considerations prevented infant class closure as distinct from school closure, but he (Dr. Coplans) did not think considerations for such finance should have any place in their discussions. Dr. Hamer's interpretation of table Z was right, and he quite followed Dr. Buchanan's criticisms.

Epidemiological Section.

December 2, 1907.

Dr. NEWSHOLME, President of the Section, in the Chair.

On the Present Methods of Combating the Plague.

By W. M. HAFFKINE, C.I.E.

I.

I SHALL begin my review by briefly enumerating the measures suggested for stamping out the plague or preventing its importation. These measures deal either with man, with inanimate objects, or with the lower animals. The first category of measures comprises:—

- (1) Discovery and notification of persons attacked with the disease.
- (2) Isolation of the attacked.
- (3) Certain precautions with regard to the disposal of the dead.
- (4) Segregation of those who have come in contact with the sick or dead.
- (5) Institution of cordons round infected areas.
- (6) A less drastic and less thorough plan than the last mentioned, viz., placing in quarantine arrivals from infected places, detaining the sick and suspected, and letting the rest free after a time of observation; or
- (7) A still less rigorous measure, which is merely to examine travellers, isolate the sick and suspected, and let the others free under a system of surveillance.

The following may, I think, be said in regard to this group of measures:—

The part played by man in the causation of plague seems, on the whole, subordinate to that of other agents. Thus, when the plague first broke out in Bombay, in the summer of 1896, it remained for a considerable time confined to a quarter called Mandvi. The mass of people there are day labourers, working outside their quarter. Though they spent the day in close communion with many other people, cases continued

to occur among the Mandvi labourers alone and in their families, and only subsequently and gradually appeared in other quarters. Since that year Bombay has had eleven consecutive outbreaks. Every year the epidemic lasts for some months and becomes relatively quiescent for the rest of the time, but the recrudescence begins approximately in the same locality and the same events are more or less uniformly repeated.

Subsequent to the appearance of plague in Bombay a township called Kirkee, near Poona, became infected, and the disease broke out among the native followers of the Royal Artillery. The men and their families lived on a spot somewhat away from the rest of the people, but spent the day at work in the batteries. Throughout the epidemic the batteries remained free from disease, while the followers suffered heavily; and they suffered practically in the same proportion as their womenfolk and children, who did not leave their homes. Similar facts were observed on the Colaba peninsula in Bombay, among men who, in the daytime, were at work in the Army and Navy Co-operative Stores and at the Gun Carriage Factory, and spent the night with their families. The other people in the Army and Navy Stores and at the Carriage Factory remained free, but the Colaba men suffered equally with their families.

Further, on many occasions it has been observed that plague first started in a town by attacking persons who had not been away and among whom no history of contact with people from an infected place could be discovered; and, vice versa, in every country invaded by the disease, there are districts, towns, or villages in which, though the people are in constant communication with infected places, and cases of plague are constantly imported into them, the disease gets no footing and the locality remains exempt from invasion.

The proposition illustrated by these facts, viz., that man does not play a predominant part in the conveyance of plague, is supported also by other observations. In 1897 a plague hospital was established in the vast premises of the old Government House at Parel, in Bombay, and a number of patients soon gathered there. In order to minimise the objections to hospital treatment families were allowed, if they so wished, to accompany their patients, stay at the hospital, and attend on them. The officers in charge soon noticed that when a family took advantage of this permission to dwell in the midst of numerous plague patients, its members were safe from disease; but when they remained in their own home, although the only case of plague had been removed, other cases often followed. In the same way, very rarely has it been seen that any

of the permanent attendants in plague hospitals have taken the disease. Pneumonic cases alone have proved dangerous in this respect.

The observations above quoted warrant, I believe, the following propositions, now more or less generally recognised, viz., that (1) plague is what has been termed, in a general sense, a disease of locality; (2) that it is contracted principally at night; and (3) that the part which man plays as direct agent in its propagation is a more or less subordinate one. This being so, the measures taken with regard to man, even when carried to perfection, can influence the propagation of plague only to the same proportionately limited extent. In the vast majority of cases events have conformed with this conclusion, in that precautions taken against the importation or the spread of plague by man have failed to secure the desired end. It must, however, be stated that these precautions can rarely, if ever, be carried to perfection. Their application is fraught with great difficulties, and is often impracticable. This is due to the impossibility of enlisting the self-sacrificing co-operation of individuals, to the first cases being rarely recognised, to the reluctance of those falling ill to deliver themselves into the hands of strangers and officials, to the measures of prevention hurting trade and numerous private interests, and to the consequent wholesale evasion of prescribed rules. The time, therefore, arrives when the measures directed against man are relaxed or dropped, and efforts are chiefly applied to inanimate objects.

II.

This part of the programme seems lighter of accomplishment. The list of measures, within an area infected, comprises, in this case, destruction or disinfection of houses, furniture, clothing, bedding, carriages, goods, warehouses, grain and other stores, garbage, drains and streets. Outside the infected area the measures consist in the refusal to admit carts, trains and ships with goods from infected places; or in the refusal to admit only certain goods; or in mere inspection of trains, carts and ships, and some procedure by which these, and the goods they convey, as well as the belongings of travellers, are sought to be rendered harmless. All these measures are intended for the avoidance or destruction of plague germs which may possibly exist in the objects concerned.

Plague bacilli have, however, been very carefully looked for, but so far have not been discovered in the earth, on the walls or floors of houses, or on any inanimate object, unless they were quite obviously and recently soiled by the products of a plague patient. I am not, moreover, aware of a single instance in which the extension of this disease

by means of goods of an inanimate nature has been conclusively demonstrated, though linen, clothing, handkerchiefs, and other personal belongings of a sufferer from pneumonic plague, if soiled with his sputum or nasal discharge, must be dangerous for a certain, possibly long, period of time. Further, the microbe of plague is not a resistant organism. From the first it was seen that under ordinary circumstances it was easily killed by disinfectants, and that exceptional conditions are required for that microbe to resist and preserve its vitality. Under these circumstances the following conclusion might seem justifiable: If inanimate objects are important carriers of plague, disinfection should generally be an effective check to its spread, and on this presumption the above measures were devised.

According to numerous observations, however, made by health authorities, a house, its furniture, all the belongings of the inmates, and the inmates themselves may be washed and disinfected repeatedly, and yet cases of plague may occur subsequent to each disinfection, if people are allowed to stay in that house. Though general statements to this effect have been made by earnest observers, I am not aware of a precise demonstration of a case in which disinfection arrested the development of an epidemic of plague.

The above theoretical considerations must be supplemented by the following remarks of a practical nature: The expense and the difficulties of destroying or thoroughly disinfecting houses, goods, and other property over a vast area are very great, and the agency for properly carrying out such measures is not available or is not forthcoming.

The enormous bulk of merchandise conveyed nowadays by rail and ship admits of no process which would answer to elementary requirements of disinfection; and the opposition and hostility of vast numbers of people, whose interests are interfered with by these measures, can only be estimated when the task is actually undertaken.

III.

I come to the measures relating to the lower animals. These are:—

(1) Destruction or keeping away of rats by poisoning, trapping, tar and sulphuric acid mixture, or through the agency of the domestic cat.

(2) Improvements in towns and villages, with a view of reducing or keeping out the rat population, viz., structural alterations of dwellings, warehouses and grain stores, demolition of insanitary buildings, introduction or improvement of conservancy arrangements, prompt disposal of garbage, periodical inspection of stores, paving and draining of streets, and certain other measures.

(3) Destruction and dispersion of fleas by petroleum or other insecticides.

(4) Fumigation of houses as a temporary protection against rats and fleas.

(5) Obligation on ships from infected regions to anchor away from the shore; or,

(6) Provision of mechanical arrangements for preventing the landing of rats along mooring cables and gangways; and

(7) Fumigation of ships arriving with plague patients or plague rats on board.

The measures have, therefore, for their object, and, I believe, rightly so, the rat and the flea, described by Rothschild under the name of *Pulex cheopis*; but epizootics of plague break out also among squirrels, tarbagans, guinea-pigs, monkeys, mice, kangaroos in Australia, and some other animals, which contribute to keeping the disease alive.

Measures for the destruction of rats were applied in India at the beginning of the epidemic, viz., in 1896, by Professor W. J. Simpson, then Health Officer of Calcutta, and have been carried on also in the subsequent outbreaks in many places. A new impulse has been given to them by the labours of the recent Plague Commission in Bombay. But nowhere, possibly, has the effect of these measures been more carefully gone into than in Sydney, under the direction of Dr. Ashburton Thompson. The campaign against rats and fleas is the most rational and the best founded of all the procedures suggested for stamping out the plague, for outside the human body in animals alone have plague microbes been actually seen so far in nature. It is, however, essential to estimate the extent to which this is a promising direction. Various factors, such as increase of the human population, destruction or planting of forests, occupation of waste lands, building of canals, introduction of new animals and plants, and a variety of other circumstances bring about, in the course of time, important changes in the flora and fauna around us. I might quote, as relatively modern instances, the disappearance of wolves from Great Britain, or the practical extinction of the bison, or of the black rat, from these islands and the continent of Europe, and a few others. These changes have taken place gradually, and in such long periods of time, that the exact causes which have brought them about are unknown.

Up to quite recently it would have been impossible to name a single instance of a result of this kind having been effected in a short time by steps of an administrative character, or even by the resolve of a whole population. From time immemorial man has had to put up with the

presence in his proximity of animals and plants interfering with, and devastating, his crops—locusts, field mice, spermophiles, campagnols, phylloxera, mildew, rabbits in Australia, and so on. The power of adaptation and reproduction with which nature has endowed many of these animals and plants generally triumphs over the deliberate efforts of man when the surrounding circumstances are favourable to their multiplication. Still the problem is not wholly impossible.

The recent successful instances, to which I have alluded, are the campaigns against mosquitoes in Ismailia, in Klang and Port Swettenham, in the Panama Canal zone, and in a certain number of other places at which it has been found possible to alter, in a short time, the surrounding conditions so as to render the propagation of these insects impossible. These examples are a grand and splendid lesson to the world, but a lesson which, it must be acknowledged, is, in many cases, difficult, and in others, impossible of imitation.

The observations made by the Chief Medical Officer of New South Wales are of interest in this connection. I have in view his carefully organised campaign against rats in Sydney, with the object of protecting from plague a white population of a high standard of intelligence and education. During that campaign Dr. Ashburton Thompson found that the gross returns of rats and mice caught and destroyed, week by week, were nearly uniform, and that there was thus no evidence that the slaughter produced such an impression on the general horde as would have rendered collection progressively more difficult. The opinion he came to was that extermination of rats in any large area by poisoning and trapping was practically impossible, and that the plan of spreading among them an artificial epizootic by means of Dr. Danysz's rat virus failed on account of that virus rapidly losing its virulence. Regarding this latter point, one cannot forget that India has now had, in the plague bacillus, eleven years' experience of a most devastating virus for these animals, and as yet there is no sign that this involuntary experiment has rid the country of their presence.

The observations coming from Japan, where determined efforts have been made to destroy rats, are as little encouraging. The facts published in June of last year were to the effect that in Tokyo alone 4,800,000 of these animals had been killed, but the slaughter seemed only to have prepared more favourable conditions for the multiplication of the survivors.

Dr. Ashburton Thompson's experience, in regard to facilities given by householders in Sydney for the detection of plague rats, was identical

with that gained in India. He found that the people were reluctant to admit to their premises rat-catchers and other strangers bent on that task, and that the information supplied by the inhabitants, as well as that gathered by the professional men specially appointed for the purpose, was so scant as to be barely sufficient to indicate the presence of infection in a locality, but not to gauge its severity. Though, therefore, the measures against rats, either by extermination or by change in the construction of cities and villages, are a most important item in an anti-plague campaign, the question whether any noticeable impression can be made on the epidemic by these measures within the length of a generation, or even in a longer period, is a matter of great uncertainty. Even the destruction of rats on ships alone, if imposed as a general measure, would cause a dislocation of traffic and an outcry formidable to face. The result is that every day plague is imported, though fortunately it does not spread, into one part or other of the maritime countries of the world.

IV.

The above analysis of the facts connected with the problem of stamping out the plague leaves little room for surprise when it is seen that, although in many places reached by the plague, the latter, as I have just mentioned, does not take root and dies out, in others, where it finds a congenial field for its propagation, the attempts at eradicating it prove unavailing. Thus often ends in disappointment what may be termed the *first stage* of the struggle against that disease, namely the efforts of stamping or keeping it out. This result becomes apparent to the population, who are the sufferers, long before the medical or sanitary authority makes up its mind to acknowledge defeat; and when they first become aware of it the people fly in a stampede in all directions. For, although bare figures of the plague death-rate impress different people differently, there can be no doubt as to a plague actuality being a terrifying event. It takes time to get used and, so to say, reconciled to it. European countries must still have some recollection of their own experience of the matter. The people therefore flee and seek shelter in other towns. But their means of livelihood are left behind in the old place: nowhere is employment and sustenance ready for new and sudden arrivals. After a period of suffering and hardships the fugitives return in search of work to the old place, and resign themselves to the inevitable.

I have referred, however, to the fact that when plague first occurs in a given quarter of a city it remains confined to that quarter for

a certain time. There is thus no necessity for going far afield. In the Himalayas and the plains of India the villagers, whenever possible, go out a mile or two from their houses and live under trees or in open fields. Often, however, the disease breaks out in the mountains in severe winter, and in the plains during the season of rains. To remain then in the open or in rapidly put-up shelters, with a scanty provision of clothing and bedding, with the difficulties in preparing food, protecting property, caring for and sheltering the small children and the aged, becomes an untold hardship. In towns, on the other hand, unoccupied land is scarce. The people, in fair weather, go into such open spaces and public squares as are available. A water supply, conservancy arrangements, police administration, fire prevention, patrolling of abandoned houses and property, depôts for boxes and bundles, and a number of other arrangements become necessary. With this, the deprivation of ordinary comforts of a settled home is felt so keenly that only families in whose midst cases of plague have already occurred avail themselves of these facilities. The others remain at their homes and furnish material for the continuance of the epidemic. The plan of abandoning the affected locality, for shorter or longer periods, may perhaps be termed a *second stage* in a campaign against the plague.

To whatever extent that plan is feasible, to that extent the effect of it is beneficial. It is the limited range of it and the innumerable complications which it brings in its train that finally lead the administration and the people to resort to what always seemed to me the *ultimate method* of combating the bubonic plague in the areas in which it becomes endemic, viz., that of conferring on the population immunity from the disease by means of an artificial treatment.

V.

I imagine that in this Section of the Royal Society of Medicine it would be out of place to enter into the bacteriological aspect of the anti-plague inoculation, to examine the various views from which the subject might be approached and solved, and the advantages and difficulties of each. For the purposes of the present deliberations it may, perhaps, be sufficient to enumerate the salient points of the matter, as ascertained in India in the last ten years. These are:—

(1) That in a native of that country, who is more susceptible to the disease than Africans, Europeans and some other races, the inoculation now in force in India reduces the liability to attack to less than one-third of what it is in a non-inoculated Indian.

(2) That in the one-third of cases which still occur, the recovery rate is at least double that in the non-inoculated attacked, the ultimate result being a reduction of the plague mortality by some 85 per cent. of what it is in non-inoculated Indians.

(3) That in an inoculated European an attack of plague, if it subsequently occurs, has so far always ended in recovery.

(4) That the inoculation is applicable to persons already infected and incubating the plague, and prevents the appearance of symptoms, or else mitigates the attack, a fact which disclosed a basis for the bacterio-therapeutic treatment of disease.

(5) That in natives of India the degree of immunity conferred by this inoculation, though gradually vanishing, seems to last during several outbreaks of plague; and that

(6) In Europeans the effect has not yet been seen to disappear in the space of time, since 1897, that this inoculation has been under study.

I now proceed to matters which concern the epidemiological aspect of the question, viz., the place which experience has indicated should be assigned to this plan of defence in plague-stricken provinces.

His Majesty's letter on the plague, addressed to the Governor-General of India on August 13 last, and Lord Minto's communication to the heads of local governments and administrations, have brought about a renewal of efforts to bring down the plague mortality. Lord Minto's letter points out that many expensive and harassing operations carried on in the past may be safely abandoned, and expresses the hope that, with the assistance of the people themselves, some distinct advance will now be made towards bringing the ravages of the pestilence under control. Consequently, in most places fresh campaigns have been undertaken and organised in the light of the teaching gained during the past decade.

The Province which has had most of this unhappy experience is the Bombay Presidency, where the disease appeared first, viz., in 1896. The result of this experience may, I think, be gauged from the following official utterances: On October 7 last, the Hon. Mr. Muir Mackenzie, then Acting Governor of that Presidency, in a speech addressed to the Municipal Corporation of Satara, summarised the mutual position of the two principal measures on which the Bombay Government have learned to rely in the struggle against the plague. "Evacuation," he said, "is no doubt effective *quantum valeat*. But think of its drawbacks. I doubt if it would have been possible at all during the torrential rains of July and early August. If managed, think

of the miserable discomfort, the risk of chills and fever ; and, at its best, what a dislocation of business, what a disturbance of home, what expense, what discomfort, is entailed by evacuation. Evacuation will not cure the stoppage of business, the closing of schools of which you complain. But if inoculation were general none of you need stir—your business would continue, your schools would be full, everything would be as before. I can fancy that in the old days small-pox may have entailed the same miseries as plague does now—fleeing the town, the runaways carrying infection ; deserting the home only to catch the disease on daring to re-enter it. Now people, being vaccinated, are hardly disturbed when small-pox breaks out. Let it be the same with plague. Be inoculated at the first sign, and so obviate disturbance of the domestic and educational and business avocations of yourselves and your children."

Sir George Sydenham Clarke took over office as Governor of Bombay a few weeks ago, and on November 12 addressed to the vernacular newspapers a letter of which some telegraphic information has reached this country. He emphasised the heavy responsibility which rested upon the papers of using their influence with the natives to prevent the spread of the scourge. He acknowledged that if the people were unwilling to destroy the rats which were the vehicles of the disease, their feelings must be respected, and he therefore urged that recourse should be had to universal inoculation, which, he stated, was the easiest and most certain method of prevention.

The experience gained in the Punjab (the other great Province of India ravaged by the plague) has been stated in a memorandum which the local government addressed to the Government of India on June 30, 1902, after five years of the application of various anti-plague measures. According to this statement *segregation of patients and "contacts,"* under the conditions which are essential to the success of that measure, is entirely out of the question, and intercourse between infected and uninfected places is in most cases quite unrestricted ; *evacuation* is not a procedure which can be of assistance in checking the extension of plague from one locality to another ; *disinfection* cannot be relied upon as a practical measure for the arrest of the epidemic ; and there remains only *inoculation* with the plague prophylactic, and its benefits, the government declares, are so generally understood in the Punjab that a large proportion of the population of the infected districts can, without much difficulty, be induced to submit to the operation.

The part of India now exposed more dangerously than all the others is the United Provinces of Agra and Oudh. These provinces have at

present, as head of the administration, the able civilian who, in 1898-1900, accompanied and took part in the investigations of the Indian Plague Commission, and had an opportunity of making himself closely acquainted with the working and the results of the various plans tested for combating the plague. In publishing, in the beginning of September last, His Majesty's and the Governor-General's letters on the plague, Sir John Hewett, the Lieutenant-Governor, issued a detailed plan, approved by the Government of India, of organising a special service to carry on inoculation when plague reappeared. The poor, who cannot afford to lose their earnings during the day or two of rest desirable after inoculation, are to be given assistance up to a sum of one rupee per person. Government servants are to have inoculation leave for the necessary period. Railway companies, and other employers of labour, are requested to give similar facilities to their employés.

The resolution issued by the Government on the subject ends by saying that the Lieutenant-Governor "*earnestly appeals to everyone interested in preventing the manhood of the country from being sapped and its vitality destroyed by the scourge of plague, and particularly to the leaders of native society and non-official Europeans who employ labour on a considerable scale, to aid in the endeavour to induce the people to protect themselves by inoculation.*" Subsequent to this resolution the Government of the United Provinces issued orders offering also facilities for those who wish to vacate their houses, and giving detailed and well thought-out directions for the destruction of rats.

Mr. President and Gentlemen, I have endeavoured to place before you the present position of the various measures suggested and tried so far in combating the plague as an epidemic. I have not entered upon the subject of curative treatment of plague, because this would perhaps be outside the scope of this Section, and because the result of that treatment leaves much, if not everything, to be desired.

Protection of India from Invasion by Bubonic Plague.

By J. ASHBURTON THOMPSON, M.D.

SELECTION of this topic for discussion by a stranger to India requires justification. I point out, therefore, first, that Australian conditions happened to be so favourable to the epidemiological investigation of plague that data of two classes were there acquired with comparative ease, viz., (a) fundamental data which concerned the disease itself and which, consequently, hold good in all countries and under all circum-

stances; and (b) data which concerned practical administration, which are liable to modification in different countries by local habits. And then, secondly, I would say that I have no intention of trespassing on the province of the administrator, at least in the details of his work. I propose to speak rather of the statesman, and to point out that which I conceive to be the sole and irrefragible principle which he must impress on administrative staffs if he would achieve any permanent reduction in the susceptibility to invasion by plague which is so marked a feature of the conditions of life in India.

The fundamental data acquired at Sydney were the following:—

(1) The epidemic spread of plague occurs independently of communication of the infection from the sick; consequently, the infection of plague spreads by means which are external to man, and which are independent of his agency as subject of the disease. The data on which this conclusion is founded were first published in November, 1900.

(2) The plague rat is harmless to man; it is, nevertheless, the essential cause of epidemics; consequently, some intermediate agent is necessary to convey the infection in efficient form from rat to man. The evidence for this conclusion was first published in July, 1903.

(3) The intermediate agent between rat and man (and between rat and rat) can be no other than the flea foreshadowed by Simond, and, further, actually is the flea. This conclusion also was published in July, 1903, together with the exact observations made in the field from which it was deduced.

The administrative data then acquired were many. They were all referable to the fundamental data; and when it appeared, as it sometimes did, that the conclusions of this class were not in accordance with experience in other parts of the world, it was still found that the differences were apparent and not real, and were easily explicable by the fundamental data already mentioned. For the sake of example the following instances may be cited. One of them was that transfer of the sick to hospital is a very important curative measure, but is quite without importance as a preventive measure. Another was that there is no such thing as infection of localities or places, although the disease is acquired by resort to certain localities; the explanation is that the local rats are infected, not the places themselves. A third was that clothing never becomes infected with plague, and is never a cause of spread; and it was easily seen that the contrary experience commonly recorded in India was not inconsistent with that conclusion, but was explained by the fundamental datum that the infection is communicated by fleas, which in India

very much more commonly infest the people and their houses than in Australia, where such infestation is, for the most part, absent. Observations of the class now referred to may or may not hold good in all respects in changed social conditions; but there was another among them which has not yet been mentioned, and which is certainly of universal applicability. This was that the infection of man was most usually contingent on his being within buildings together with plague rats; and on considering the fundamental data it became evident that a certain proximity between man and the minute agent of his infection—the flea—must be necessary. Hence it appeared plainly that the exclusion of rats from occupied buildings must be an important item among steps for the prevention of plague, for from the rat alone does the flea derive its power. But more than that, the longer this point was contemplated the clearer it became that the rendering of occupied buildings rat-proof was absolutely the most important item in plague prevention, and even the only one to which the epithet “preventive” could be justly applied. The reasons will be referred to presently; here I would merely note that I advocated this view also first in 1900, and then predicted that its simplicity, and perhaps also its apparent indirectness, would militate against its acceptance by the laity who control the purse, and consequently the means of carrying it out. And it is still the case that attention is concentrated on other measures which, in reality, are merely remedial, or merely palliative, and which are consequently interminable. This, then, is the point to which I wish to draw especial attention; but I must add that I take it to include and to cover destruction of the harbourage which rats find outside, and in the immediate neighbourhood of, buildings. The difficulty of saving the people in a place from attack is proportioned to any difficulty there may be in preventing the access of rats to the buildings occupied by them; but the difficulty of clearing plague away from the place itself is proportioned to any difficulty there may be in removing the harbourage which rats find in the mouths of sewers, in heaps of lumber and rubbish, in loose earth and rubble-fillings, and in dilapidated sheds or the like structures.

It should be noted that the administrator who is faced with an outbreak of plague is perfectly right in relying on immunisation of the people—a possibility laid open to him by the genius of Mr. Haffkine, here present—on evacuation, and on the destruction of rats. These are his only, and fortunately his very effective, means of staying it. But the statesman should be caused to understand that the control of existing epidemics is not a subject to engage his supreme abilities, and

that his preoccupation should be how best to diminish the susceptibility to invasion of his country as a whole. The methods just mentioned (I must repeat it) are in fact remedial, not preventive, and consequently they are, as I have already remarked, interminable. If a population be immunised this year it must, if it be reinvaded, be again immunised in a twelvemonth, or a little later ; evacuation may have to be repeated even during the same season ; and to the killing of rats there is literally no end at all. But every building which is rendered inaccessible to rats may be regarded as a fortress impregnable to that enemy for ever. This, then, indicates the only road the statesman can fitly take ; a road, namely, on which every step must be directly towards the goal, and on which there cannot be any backsliding.

The arrest of present outbreaks is a quite different matter from diminution of the liability of the country to suffer them. Removal of the conditions which constitute its susceptibility can alone be justly spoken of as preventive action. And it is, I think, of little use to place scientific truths before the laity unless the expert points out their practical bearing and application at the same time. In order to judge in how far true that is, it is only necessary to ponder the *Gazette Extraordinary* which was published by the Government of India during August of this year. That *Gazette* draws attention to the essential part played by the rat, to the essential agency of the flea, and to the insignificance of deposited infection ; but it also expresses the opinion that this knowledge, acquired by it from the remarkably brilliant reports of the Plague Research Committee, will probably not render the task of prevention much easier than it was before. The *Gazette* even mentions the desirability of excluding rats from dwellings, but only to dismiss this method with the remark that it is impossible to expect much improvement in the construction of buildings in the near future. The all-important distinction mentioned above between remedial and preventive measures is not perceived.

This pronouncement, then, appears to be rather less far-seeing than might reasonably have been expected. For there are many other considerations which must be entertained besides the crude facts which are recited in the *Gazette*. It should be noticed that plague seems to have taken its place among the endemic diseases ; and if the uncertain teachings of history seem to offer some prospect of its ultimate extinction by natural process, it should be borne in mind that present circumstances are vastly different from those which formerly obtained, and especially in relation to traffic. To-day plague is a disease to be fought

persistently in India, as, I suppose, typhoid fever and cholera are there fought. No speedy exemption is, in my opinion, to be expected.

It must be frankly said that the method of exclusion is practically impossible in the smaller villages, in the larger villages, and in the lesser towns; but this admission is very far indeed from covering the whole case. In the first place, it is precisely in those smaller and more or less circumscribed collections of huts and houses that the palliative or remedial measures are easily successful and, provided the infection be not reintroduced, permanently successful. In the second place, whence do Indian villages derive their infection? Is it not from the great cities on the seaboard and from the larger inland cities which have become secondary distributing centres? And is it, indeed, quite impossible to apply the method of exclusion in them?

I do not doubt that when a broad and comprehensive survey of all the data has been taken, it will be perceived that the exclusion of rats from occupied buildings in cities is the only measure which can permanently diminish the susceptibility of India to plague; and that, as soon as this principle of action has been grasped, resolutions taken by Government will be conceived in the spirit which animated that courtier who, when he was desired to undertake a business which the King himself thought it hardly possible to carry through, replied "Sire, if it be difficult, it is already done; if it be impossible, it shall be done."

• *Note.*—With reference to this paper the following letter has been received:—

SOUTHERN PUNJAB RAILWAY COMPANY, LIMITED,
70, CORNHILL, LONDON, E.C.,
December 7, 1907.

SIR,—In reference to the meeting of the Epidemiological Section of your Society on the 3rd instant, my Chairman, Sir Bradford Leslie, desires me to draw attention to a remark made by Dr. Ashburton Thompson that "Every building which was rendered inaccessible to rats might be regarded as a fortress impregnable to that enemy (plague) for ever"; and in confirmation of that view I am to forward the enclosed report of his speech at our last half-yearly meeting, at which he stated the fact that the members of the native staff on the North-Western State Railway, who reside in rat-proof cubicles, with brick walls, brick and cement roofs, and cement floors are virtually immune from plague. Sir Bradford hopes that this corroboration of Dr. Ashburton Thompson's views may be useful to him. I am also to mention that in Bengal, where the climate is humid, water is abundant and daily bathing is the rule, plague does not gain the same foothold as it does in the drier climate of the North-West and the Punjab.

I am, Sir, Your obedient Servant,
URBAN BROUGHTON (Secretary).

EXTRACT FROM SIR BRADFORD LESLIE'S SPEECH.

"During the half-year under review, *i.e.*, January 1 to June 30, 1907, the plague has been worse than ever, the total number of deaths in the Punjab being not less than half a million, or at the rate of nearly 25 per 1,000 of the population. This number is greater by

400,000 than for the half-year to June 30, 1906, and about 150,000 more than for the whole of the year 1905. Even in the town of Bhatinda, with a population of only 13,000, there were over 700 deaths, and in Delhi over 11,000 deaths out of a population of 209,000, or about 1 in 20 of the population of each place. Unfortunately, it is generally young people in the first vigour of their youth who are struck down. It is remarkable that the North-Western State Railway employés, who number some 55,000 in the Punjab, where they are housed in staff quarters on railway land, with proper regard to sanitation on European principles, had a death-rate of only 1 per 1,000 per annum, including their families; but in places like Lahore, where, for want of space, the railway employés have to live in the native towns, they do not escape the prevailing disease. It is hoped that His Majesty's gracious letter to India on this subject will stimulate investigation and remedial measures."

DISCUSSION.

The PRESIDENT (Dr. Newsholme), in introducing the authors, reminded the Fellows that the meeting was a special one, called in the first place to do honour to two distinguished confrères, and secondly to enable Fellows to learn that which they were so competent to teach. He did not think it possible to imagine a greater contrast in the conditions under which plague might prevail than those in India and those in New South Wales. In one instance was a community fully invaded by the disease, in which differences of race, religion, and civilisation held good, and in which measures which might be successful under the conditions of western civilisation would obviously not be completely available. On the other hand, there was a city like Sydney, well governed, inhabited by a people who were our own blood relations, and who recognised the importance of sanitation. Those were the two classes of experience which would be placed before the meeting. In one case it was a relatively easy task to keep the plague under control; in the other it was extremely difficult, especially when, as was the case in India, the disease was already rampant when Mr. Haffkine's genius discovered the remedy which had done so much to minimise the prevalence of the disease and to diminish its fatality amongst those who were attacked by it. On that point there was no difference of opinion among those who had had the opportunity of investigating Mr. Haffkine's remedy for plague. One could realise the immense importance, in a country like India, of having such a remedy which could be adopted when ordinary measures of sanitary control and prevention of importation were, to a very large extent, inapplicable. Those present would congratulate Mr. Haffkine on the fact that he would shortly be returning to India to resume his most important work there. That work had been interrupted for a short time through no fault of his, and they congratulated not only Mr. Haffkine but, still more, India, in that it was again to have the benefit of his invaluable services. He had said that, in Sydney, the task of keeping plague out and preventing its spread was a simpler one than in India; but that by no means detracted from the merit of Dr. Ashburton Thompson's pioneer work on plague in Sydney. Those who had read his masterly reports on plague in Sydney must have felt with what care he investigated every detail concerned, and got to the bottom of every outbreak. They were masterly expositions of epidemiological research.

The following observations were contributed by Major ARNIM, I.M.S. : It is true that in the earlier stages of an outbreak—when only a few foci of the disease are known to exist—the use of the full epidemiological armament of notification, isolation, disinfection, segregation, &c., is justifiable ; and it is expedient to isolate the patient, disinfect his house and belongings, segregate contacts, &c. With regard to the isolation of the plague patient, it is a question whether his removal to a suitably situated isolation hospital, where he is inaccessible to the *uninfected* rat flea, is not quite as justifiable as is the measure—now adopted in the prophylaxis of malaria—of isolating a malarial patient from the possible attacks of the *uninfected* mosquito. In the earlier stages of a plague outbreak the above measures are, I think, justifiable. But in instances where the disease has assumed a widespread epidemic or pandemic form, these measures are useless, and their application to a locality causes unnecessary inconvenience and suffering. We are, under these circumstances, thrown back upon the three lines of defence which experience and observation have shown to be of most value. I refer to (a) preventive inoculation ; (b) the removal of the community from the rat-infected area ; (c) the removal of the rat from the infected or threatened area. It is upon this latter measure that I would ask permission to say a few words, and upon an aspect of this subject to which I believe sufficient importance is not yet attached by plague administrators. The value of inoculation has already been referred to, as have also the advantages of evacuation and the great difficulties often attending it ; the task of efficient rat destruction by poisoning, trapping, &c., has been declared to be “practically impossible” ; but no great stress has been laid upon systematising what might be termed “rat prevention.” I refer to the taking of simple but rigorous and systematic measures to prevent the congregation of rats in large numbers in areas threatened with plague. Rats are natural scavengers, and will congregate where there is waste food, garbage, or rubbish lying about. Where debris of this nature does not exist, the rat will not be found—he vanishes. As an instance : I have in mind a large Indian town of over 100,000 population where plague appeared in 1897. Among my other duties connected with the outbreak I was asked to take special charge—with regard to preventive measures—of the Sudder Bazaar, an area which was situated between the military and European lines and the native city in which the disease had appeared. The first step taken in dealing with this area was to make a minute inspection of the houses. In the basement of each house was found a mass of garbage—filth and rubbish of all kinds. Only to the person who is well acquainted with the interior economy of the native house of India is known the heterogeneous mass of rubbish which is allowed to collect in the basements of the premises. In this instance I ascertained that the reason of these unusually large collections of rubbish was mainly due to defective scavenging, and to punishment being feared if the debris was thrown on to the streets. Hence, all house sweepings, organic debris, old rags, and in many instances absolute filth had been allowed for long periods to accumulate in the house basements. I enlisted the assistance of the householders, and had all the basements of the houses cleaned. The rubbish was

removed by sweepers into the roadways in front of the houses and there burnt (for days afterwards the Sudder Bazaar was enveloped in smoke); and the basements were then lime-washed, and latrine receptacles renewed and tar-painted. Plague never appeared in this area in true epidemic form, and the place came to be considered as protected from the disease, which was virulent in its vicinity, and some people attempted to smuggle their sick into the area, believing that they would become cured there. I believe that the removal of the rubbish from the houses, and the systematic cleaning up of this area, had discouraged the rats from infesting it to an abnormal degree, with a result that the incidence of disease in the area was much diminished. It is a matter of common observance that on occupying a house which has for some time been tenantless, the place may be absolutely free from rats and mice. After a time, when food has been left lying about in the larder, or on shelves and tables, rats and mice will appear. So it is with houses in India, and more especially so on account of the prevalence of the unpaved and uncemented basements which exist in nearly all the native houses. I merely speak these few words in the hope that general cleanliness of houses, and more especially of their basements, will occupy a more prominent place in future plague policy. People should be encouraged to keep the basements of their houses scrupulously clean, and should be advised not to allow any refuse, waste food, old rags, or filth, or debris of any kind to collect in their areas; and should be further urged to keep their cooked food and uncooked food supplies in such a manner as to prevent rats having access to them. The greatest boon to India would be if the natives—both Mohammedans and Hindoos—could be induced to regard the rat as the Mohammedan regards the pig, and that any food or matter with which the rat had come into contact became regarded as spoiled and tainted.

Professor W. J. SIMPSON said he had had the advantage of reading Dr. Ashburton Thompson's paper, as well as Professor Haffkine's, so that he was in a better position than otherwise he would have been to take part in the discussion. He had read both papers with an interest which was increased by the fact that the authors presented the subject from different points of view. On one point he thought most would agree with both authors, namely, that the rat plague played a predominant rôle in the causation of human plague. Perhaps Dr. Thompson had given expression to that opinion too broadly, for it had to be qualified by the fact that pneumonia plague, at least, might have nothing to do with rat plague. Unanimity on the relationship of rat plague to human plague marked a distinct stage in the etiological and preventive aspects of the disease, because in the one case it allowed of further investigations being undertaken without any disturbing uncertainty on a very fundamental question, and because in the other case it indicated the direction in which plague measures should be taken, and which Professor Haffkine had called a rational method for dealing with plague, which could be done without waiting for the complete solution of the problem which it was hoped might be reached by continuous and systematic investigation. Dr. Thompson had stated his views shortly and clearly, and no one could complain of any hesitancies. On reading

the paper one would come to the conclusion that the whole problem of plague was settled, because Dr. Thompson held that the plague rat was harmless to man, and that the intermediate agent between the rat and man and between rat and rat could be no other than the flea, and actually was the flea. Those views were based on his own observations and on the results of experiments by the Plague Commission. They, however, erred in an inclination to generalise too much on insufficient data. In illustration of that he quoted an interesting case in the last report issued by Dr. Thompson, that of a man and wife simultaneously attacked with plague. Each of them had flea-bites on the drainage area of the bubo. There were no rats at the residence, but at the man's workshop another workman had killed two sick rats and picked up two dead rats, and there were found, in the process of cleaning, the carcasses of ten rats in an advanced state of decomposition. Plague bacilli were not found in them, nor in a number of rats trapped in adjoining and neighbouring premises. The husband's illness was attributed to flea-bites received at the workshop, and as the causation of the wife's simultaneous attack could not be put down to fleas in the house, it was stated "it would seem that the only possible source of infection must have been a flea imported to her house by her husband from the factory, which she herself had not visited." The evidence was not very strong in favour of that assumption, but it was about the strongest which had appeared in any of the former reports. Hitherto with most people it had been merely a working hypothesis, supported by a few experiments, that the flea was an active agent in the propagation of plague. That hypothesis had been converted into a certainty by the experiments of the Indian Plague Commission, which had established the fact that the flea was perhaps the most important agent in the dissemination of epizootic plague. The interpretation which he put upon those experiments was that the flea was an active agent in the causation of epizootic of plague in the rat, but it did not appear to justify the claim that the flea was the only agent, or the setting aside of the successful feeding experiments of Kitasato, Yersin and Wilm in Hong Kong, the German and Austrian Commissions in Bombay, and those of Klein in this country. There was always a tendency to run the newest view to the extreme. It took time to obtain the due perspective, and he thought that was the case in this instance. At one time it was inoculation, then it was feeding, now it was the flea. Might it not be that they were all responsible? When one found that rats were susceptible to plague by inoculation, by feeding, and by the laying of plague materials in the nostrils of rats, it was difficult to see why the flea should be selected as the only agent. That was still more the case with regard to plague being always conveyed by the flea from the rat to man. The experiments on that point had been but few. They were his own in Hong Kong and the few made by the Indian Plague Commission, but the most that could be said with reference to them was that the rat flea could infect the monkey, and probably man, and they confirmed what was pointed out by Simond and Hankin in regard to that point. But that was a very different matter from the flea being the only agent. Monkeys were very susceptible to feeding with plague-infected food; why

should man be not similarly infected? In Hong Kong, where many post-mortems were made, the pathological evidence was not small that many cases of plague, apart from tonsillar and cervical cases, were produced by feeding. If the post-mortem records of the cases in the early days of the Bombay plague were examined, there would also be found evidence of lesions of the stomach, intestines, and mesenteric glands in considerable number. Possibly it was because Dr. Thompson's experience had been mostly with bubonic cases that he held such strong views on the flea theory. Septicæmic cases were not common in Sydney, and it was a strange but interesting fact that bubonic cases of plague appeared for the first time only during the sixth outbreak of plague last year. It might be asked what happened to the flea that produced that phenomenon. He thought that under the circumstances all the fundamental facts were not to be found at present in Australia, and that the last word, however desirable it was, had not been said on the causation of plague.

Mr. Haffkine's paper dealt less with causes than with methods of prevention. That gentleman accepted all the theories, for they were a matter of indifference to him, and it was only essential for him to compare the failure of other methods with the successes which attended the use of the prophylactic, and to show the superiority of that method over others. If he, Professor Simpson, had to deal with the epidemic in India, and had the choice of adopting only Dr. Thompson's method or that of Professor Haffkine, he would have no hesitation in selecting Professor Haffkine's. Dr. Thompson's remedy, which was also Dr. Creighton's, was a good one, and must appeal to sanitarians, for he supposed that in rebuilding the houses there would be included the provision of good light and ventilation, as well as protection from rats. But it failed in the very important particular that it would probably be useful for the protection of India when the next epidemic invaded that country, say in about a couple of hundred years. The statesman, therefore, who adopted Dr. Thompson's policy might be hailed by the remote descendants of the present generation as a benefactor, but he would scarcely be considered to be carrying out what were ordinarily understood as the functions of a statesman, namely, the solving as far as possible of the problems which arose for the benefit of the present generation and those of the near future. He would further state that even if the rebuilding of India could be carried out in ten years, much of its value would be discounted by the customs of the people. Wherever the Indian lived he liked to have his grain with him, which was natural, just as our own housewives like to have their stores in the house. Plague had been known to attack Indians and leave Europeans free, even in cantonment houses which were well built and where Indians had at times been permitted to reside. The reasons for the invasion of plague into such well-built and sanitary houses had been that the rats of the locality had been attracted into the particular houses by the granaries established there. Plague had also occurred in gaols, which were generally well built, and it had occurred even in some of the newly built houses erected by the Bombay Improvement Trust. Last year he visited several of those houses with Dr. Turner, the Health Officer. The rats gained access to the houses by creeping

up the rain-water pipes and by other means. There could be no doubt that the most immediate and probably the most easily applied preventive, if the confidence of the people were obtained, was inoculation. It could be applied on a small or on a large scale. In Calcutta, whenever a case of small-pox occurred in a house, the inmates of the house and those of the immediate surroundings were, as far as possible, vaccinated. A similar arrangement might be introduced in regard to plague. Simultaneously an organisation should be formed to popularise and carry on inoculations on a large scale in every infected centre. Probably that would be done when Mr. Haffkine returned to India. The weak point in the inoculations, however, was that the protective power did not last very long, and so long as that defect lasted he feared it would always be difficult to induce people to be inoculated every two or three years, except under the stress of a great mortality. It was for that reason that, although inoculation must be recognised as a powerful weapon in the hands of the sanitarian, it could not be depended on alone; a general fighting an enemy did not depend only on his infantry. It was impossible to close one's eyes to the fact that the primary cause was still existent, and as we thought we knew what the primary cause was, which was not the case when we depended on vaccination against small-pox, it appeared necessary to go further and attack the cause or causes as known to us at present. If the infected rat were got rid of, it did not much matter whether man got the disease from the fleas of rats, from infected foods, or from other agents. In the chain of causation the rat was the more important factor to deal with, and he believed that just as Professor Haffkine had been a benefactor to India by the discovery of the plague prophylactic, he would add still more to that country's indebtedness to him if he could discover a more potent microbe than Danyasz's bacillus which would destroy the rat and yet be harmless to human beings and other animals. It should not be supposed that plague was endemic or epidemic in every village and town in India, and he believed that the policy of a free and unrestricted trade in plague distribution from infected centres to healthy localities had contributed to the present deplorable conditions. Measures should therefore be taken to prevent this, either on the passport system adopted in the Madras Presidency or by others which would readily appeal to the trained sanitarian. With regard to disinfection and its supposed inutility on the grounds stated by the Commission, that a contaminated flea lost its infection in a few days, and that plague bacilli could not be found in the soil, he wished to add his dissent to that which had already been expressed by Dr. Turner. In those particular experiments it might be so, but he thought it was generally agreed that tetanus bacilli lived in the soil, but how often were they looked for and could not be found? To search in an infected room for the bacillus of plague was like looking for the proverbial needle in the haystack. Against those experiments of the Commission were other experiments. How was one to account for the fact that, according to Gladdin, the bacillus would live for over three months on food such as raw and coagulated albumen, turnips, potatoes, plums, apples, cucumbers, &c., or those of Batazoff, in which the organs of plague animals

dried in vacuum for thirty-eight days at the temperature of the room, infected animals after that period, and of those of Gotschlich, who found the bacillus alive and virulent in eight and half months old cultures which were dried and mouldy. Again, clothes would have to be disinfected, even if it was the flea which only carried the infection, as he did not suppose that the clothes would be opened up and fleas searched for. Even then they would have to be killed, and he took it that destruction by disinfectant was easier than catching them and destroying them, as the Chinese women did, by cracking them between the teeth. For carrying out any of the measures a properly qualified sanitary service was needed in India. It was because of the absence of that service that most of the failures arose. It was also the secret of the failure of the great inoculation campaign in the Punjab, where villagers, instead of properly qualified men and women, were employed to open the battle and assist in the technique of the inoculations. The Japanese had recently four towns infected, and the organisation they brought to bear on the prevention of plague was 1,200 medical men. They had 513 deaths altogether. In the Punjab there were during the epidemic of this year over 600,000 deaths, and there were in 1906 only ten Europeans and thirty-eight native medical men employed to combat the disease. If the whole 750 medical men in the Indian Medical Service had been released of their duties all over India, which was an impossibility, and had been drafted into that one province, it would not have equalled the organisation of the Japanese.

Dr. J. F. PAYNE said all the Fellows would be very grateful to Mr. Haffkine and Dr. Thompson for their exceedingly valuable papers, more especially as the authors had not remained immersed in the atmosphere of scientific doubt, but had each put their views in the clearest and most definite manner. He did not believe the views of those two gentlemen were opposed, and he did not see why the plans respectively advocated should not be carried on simultaneously. With such a combination of forces it might be hoped that a much more serious impression might be made on the great invasion of plague than by adopting any one separately. With regard to rats, it was clear that in all the places which had been investigated of late during the great pandemic of plague, rats had been found largely concerned with the distribution of the disease from one place to another and with its local production. But it had not yet been proved that that was the only source of plague, and for several reasons. Every epidemic of plague recently described in the great pandemic had been carried from one part of the earth's surface—namely, from the mountain country of Yunnan, in the south of China. There it had been endemic no one knew how long. In that country particularly epidemics of plague were connected with the deaths of animals living underground. That plague was carried from Yunnan to the coast, and thence to the south of China and on to Hong Kong, and from there distributed over the world. But plague had come from there just as cinchona plants, wherever found, came originally from America. The relation of plague to the death of rats had been before the profession for more than fifty years. Not to mention some rather obscure earlier reports, in 1853, Surgeon-General

Francis, of the Indian Medical Service, published a report in which he described how the mountaineers of Kuma, on the slopes of the Himalayas, had turned out of their houses on account of plague when they observed dead rats. That had been known to people who investigated plague in other parts of the world. For a long time the chief places for the investigation of plague were Mesopotamia, Baghdad, Kurdistan, and Persia, but not in the Far East. Those investigators in Persia and Baghdad were very careful and conscientious people, and included Surgeon-Major Colville and a French physician, Dr. Tholozan. Surgeon-Major Colville said they had never seen anything of the kind observed in the Himalayas. Though his own personal experience was very small, he wished to relate one incident. When he went out in 1879 to investigate the plague on the Lower Volga, in the province of Astrakhan, especially at the village of Vetlianka, which had become historic, the epidemic was practically over, and they only saw a few patients who had recovered. It was being much talked about, but never a word was said about rats. His own impression was that the common European rat did not exist in that country at all. The great naturalist, Pallas, who travelled there in the last century, said it did not exist there then. While waiting in the village with nothing to do, it was their custom to walk about and into the neighbouring country, where they saw many burrows made by a little mouse. He noticed many skeletons of these animals, and on asking about them was told that a number of the mice had died during the winter. He believed it was the *Mus montanus*. Since then it had occurred to him that this might have had some connection with the epidemic. The plague had in many other places not been connected with rats. At present the Yunnan plague was being carried into Egypt and other old seats of plague, and it remained to be seen what would happen. Therefore he did not think there was evidence that the connection of plague with rats was a universal law. He had no doubt that the evidence in regard to fleas was correct, but it was not necessary to suppose that clothing never transmitted the plague. People who were just dead might have clothing which might have contained fleas. In the celebrated village of Derbyshire, which had plague communicated from London, it arose from the clothes being put before the fire to dry, and it was well known that the flea could jump. He thought that they were not entitled to say that the cure or prevention of an epidemic disease like that by inoculation had no effect in checking its endemic prevalence. With regard to malaria, for instance, though it was strictly local, if there were a population saturated with quinine mosquitoes could not get hold of the plasmodium and carry it about, and this had an effect in stopping malaria. Quinine not only cured the individual patient, but diminished the prevalence of the disease. Therefore in India, if at one time there were hundreds of thousands having plague, and if that number were greatly reduced by inoculation, the chances were that the dissemination of the bacillus, the parasitic circle by which the parasite was carried from one animal to another, from man to the lower animals, and from the lower animals back to man, would be checked; it was scarcely fair, then, to say that inoculation had only a temporary effect.

Colonel MACPHERSON said a good deal had been said about the effect of inoculation in preventing plague, also the effect of getting rid of rats from dwellings. It had also been said that the flea was the conveyor of plague from rats to man. But he wished to ask Mr. Haffkine and Dr. Thompson whether they had made many experiments as to the manner of preventing the flea from biting man. One knew that there were many insecticides used by people in common life for the purpose of preventing themselves being bitten by fleas; and if the flea was the transmitter of plague it would surely be a simple process for each individual in the community to protect himself by using a definite insecticide.

Dr. SANDWITH said that nobody who had read Dr. Thompson's reports could do anything but echo the President's praise of them. Those reports first converted him to the rat theory, and later to the rat-flea theory. He was certain the rat theory was correct, and he believed the other was right also; but he agreed with Professor Simpson that it was not fleas alone which caused plague. In his paper, Mr. Haffkine said: "Though general statements to this effect have been made by earnest observers, I am not aware of a precise and convincing demonstration by experiment of a case in which disinfection arrested the development of an epidemic of plague." He (Dr. Sandwith) was very much in favour of disinfection in preventing the spread of plague, because in Egypt since 1899, though the officials of the Public Health Department had not stamped out plague they had kept it under, and this had been achieved without any of the special means recommended in the papers read to-night. Disinfection had been carried out in two ways; first, by filling up the rat holes and destroying the rats, by removing rubbish, whitewashing and cleaning buildings, isolating patients and watching "contacts." That was found to be insufficient. A second measure which seemed to be of some importance was washing the floors and walls of rooms with corrosive sublimate, 1 in 1,000. That was found to be expensive and the natives complained when they came back to their homes that their chickens had died; so for several reasons it was temporarily given up. But in the villages and houses where corrosive sublimate was used in addition to the ordinary disinfection process, plague had never yet returned, though it had often returned in places where this extra measure had not been adopted. A reference had also been made to the domestic cat, and he wished to refer to that because Major Buchanan, in India, had proposed that the plague could be minimised by increasing the number of domestic cats. But the cat is susceptible to plague, not quite so much as the rat, but still to a dangerous extent. He asked Mr. Haffkine why he said that the native of India was more susceptible to the disease than the African and European. He (Dr. Sandwith) did not know any reason for considering the African and the Indian to be on very different levels of susceptibility. It had been said that Dr. Ashburton Thompson omitted reference to pneumonic plague, but plague had so recently reached New South Wales that the authorities were fortunate in having stamped it out before pneumonic cases had occurred. Pneumonic plague was a term adopted in 1896 from Bombay, although previous epidemics had been known as

"cough-illness." Pneumonic plague in Egypt had sometimes caused eleven deaths in a house of eleven people. He did not suppose that the flea was responsible for that pneumonic plague, except indirectly. Any case of bubonic plague may become septicæmic, and secondary pneumonia sets in, and then the patient disseminating his sputum can cause primary pneumonic plague. He hoped Dr. Thompson meant that not only the laity—who should be instructed by medical men, and only by them—but also the medical men should work, not only between seasons of prevalence as the various outbreaks were called, but all the time, as some plague was present every month in endemic countries, and the fight should be continued until the disease had been absent among humans for at least a year.

Dr. FREMANTLE said there were many suggestions of definite theoretical value which, on being put to the test, were often found wanting in regard to plague, and he would be glad to hear whether one or two in particular had been tried. In regard to houses, he would like to hear whether weight had been given to the method of building which he saw at Rangoon, where, building being carried on on land largely reclaimed from the Irrawaddy, houses were built on piles, and in such a way, thanks to the general foresight of the sanitary department, that there was a clear foot of daylight between the ground and the floor of the house. It seemed also desirable to separate adjacent roofs in the same way as in this country parapets were provided to prevent the spread of fire. In such a form there would be a really rat-proof house. Whether that was the reason that Rangoon had never taken plague he did not know, but there was the fact, and he did not think it was simply due to a thoroughly carried out quarantine system. There might be some similar reason in the construction of their houses for the immunity of Japan from plague, notwithstanding that there was a good deal of intercourse between China and Japan. At any rate one saw the reverse system of house-building in Hong Kong coincident with an annual recurrence of plague. There the rats not only infected the houses, but actually burrowed again into the brittle bricks which were used within a few days of the most thorough disinfection. Unless the approach of rats was cut off, it would be of little use to rebuild the houses. It would surely be well to start experimental schemes in the centre of plague infected areas, in villages, for instance, in the Bombay Presidency and in the Punjab; that could be done without difficulty, and different schemes could be tried in different batches of houses. It had been said that the rat should be exterminated, and those who, like Dr. Thompson, had tried it in earnest said it could not be done. He (Dr. Fremantle) thought they were, in that matter, going beyond their province as medical men, and were not giving due weight to those essentially qualified to investigate it. They were dealing with a problem outside their profession, and required for its solution the assistance of a naturalist like the late Frank Buckland or the present secretary of the Zoological Society, Dr. Chalmers Mitchell, who would understand the different methods of exterminating one pest by another set of animals. In India very much was to be done by means of education, and he hoped the Government would take up

the question of education in the schools, so that the community might be instructed in the general methods employed in combating the plague. A great question was how to induce the people to accept inoculation. In the Punjab the plague officers were welcomed by the headmen of the villages and those who wished to stand well with the Government, and they and their families were inoculated, but unless plague was actually prevalent the number of inoculations would be limited to 120 or less. It might be well to adopt some method of stimulating them through a monetary payment to the headmen of the villages. Finally, he urged that the question was an Imperial one, and therefore there should be definite correlation between the various Boards and Departments interested in the matter throughout the Empire, rather than action on isolated lines.

Dr. C. J. MARTIN, F.R.S., said he had listened to both papers with great interest, but it was too late to discuss them at all fully. In Dr. Haffkine's paper there was so little matter that was controversial that he felt he must agree with him when, at the end of his paper, he pointed out that at the present time the most hopeful method for India was the palliative. As to the method in which the substance was given, all must have been struck by the extreme modesty with which the facts were presented. Even if it had been presented in a different way there would have been little cause for complaint. He listened to Dr. Thompson's paper with some emotion, because that gentleman was his earliest preceptor into the mysteries of epidemiology. A good many years ago Dr. Thompson asked him to read over a paper on the "Epidemiology of Leprosy," perhaps on the principle at the bottom of trying a substance on a dog before giving it to a human being. He did not understand much about the subject then, but the paper was crowned with a prize as being the best paper on the "Epidemiology of Leprosy" in any country, so probably the experiment was justified. But he could not allow to pass without comment the part where Dr. Thompson said that India should be rebuilt. It would be difficult to rebuild India, with 300,000,000 people, most of whom had not got houses, as we understood the term. He did not know whether the concluding passage of the paper, relating to the courtesan of the king, came from the "Arabian Nights," but it might well have done so. He hoped that king had a firm treasurer, because ultimately everything of the kind became a financial matter. Every unit of the population of India had but a small amount of money. In the finances of the country there might be a surplus of a million or so, but if the whole wealth were divided among the people they would still be very poor. It would be impossible to carry out in such a country measures which were successful in a city like Sydney, with its wealthy population. In conclusion, he wished to pay a tribute to the extraordinary epidemiological acumen by which Dr. Ashburton Thompson was led, quite early in the study of plague, to realise first of all the essential dependence of human epidemics upon rat epizootics, and, secondly, to the fact that there must be some intermediary between the rat and the human being in order that a rat plague might cause a human epidemic.

Dr. CHALMERS (Medical Officer of Health, Glasgow) said he had scarcely any reason for interposing in the discussion, because one of the papers was on the prevention of plague in India and the other was devoted to a method of combating plague which was not applicable to this country, and which he doubted the suitability of to India. He said that because in this country for two or three generations we had had a similar experience in regard to small-pox; we had not yet succeeded in convincing people that they could, by vaccination, protect themselves against small-pox. So he was not hopeful that, without a panic in India—which no one wished to see—it would be possible to press inoculation to the extent necessary to stamp out the disease, because in twelve months it might be necessary to do it all over again. The whole genius of the country was against the rebuilding of houses rat-free; it had taken two generations of medical officers to persuade the authorities that even in the matter of ordinary diseases the rebuilding of houses was necessary. And all knew how slowly rehousing went on, even in slum areas in England and Scotland, and one asked whether it was likely to be more successful in the case of plague. His own knowledge of plague was acquired in this country, and the experience of anyone here was that there was first of all a genial tolerance, as of a momentary vagary on the part of the medical officer, and secondly, there was a discussion as to whether this or that should be done, no credit being given for acting as a reasonable being. All regarded the rat-flea theory as having some association with plague. The work of the flea had been demonstrated beyond cavil in the last report from India. In his first experience of plague in 1900 he talked the matter over with Sir Thomas Fraser, and told him he was worried about the rats, as people told him they were kept awake at night by them. Sir Thomas's reply to that was that unless the rats were seen and came into the open there was nothing to fear, and that that was the experience in India. But that was not the experience in Glasgow. They endeavoured to catch the rats, but none of those caught were found to have plague, except one, which was caught in the ordinary run. Several times rats were caught which had plague, but no one near was suffering from the disease. The most recent experience was in a particular building, where there was a sanitary officer on duty most of the day, police constables occasionally, a caretaker and a Sunday school class muster. In that building thirty-one rats died, and by the merest chance the thirty-first was found to have plague. Hankin, two or three years ago, suggested that while one might accept the rat as being a continuer of plague, possibly something made the flea at one time capable of carrying the disease and another time incapable of doing so. That was only part of the larger question as to why we were having plague in the last ten years. If any explanation of that fact were forthcoming, any light as to means of overcoming it might be clearer. He did not know whether the killing of rats would do any permanent good, for there was a natural law that the birth-rate of any species was directly related to its death-rate, and possibly the result of a vigorous campaign against rats might be an increase in their birth-rate. In India it had been said there were now as many rats as ever, notwithstanding the enormous

destruction of them during the last ten years. With regard to disinfection there were two views to keep in mind. The plague organism must be assumed to live outside the body, but only to a limited extent. If chemical methods of disinfection were used there still remained the flea. He had used formalin, but air-breathing animals would not be affected by formalin. It was known, from the work done in India, that a flea fed on a septicæmic rat would communicate the disease for a definite series of days if it were fed daily. How long would a flea not fed in the usual way live? If the flea was capable of transferring the infection from one animal to another, and if a rat could live without feeding for that period, how far might it travel? He asked because of a certain association with rags in his own experience. Recently there was some cause for suspecting that rags might have caused a case of plague. And in order to catch the rat-flea guinea-pigs were put in cages in the rag store. Human fleas were caught in the rag store, but no human fleas were caught in the house. They put human fleas into test tubes, and allowed them to have plenty of air, and until the ninth day those fleas remained active without any food at all. He did not know whether the rat-flea would live longer. With regard to Mr. Haffkine's proposal as to the disposal of the dead he (Dr. Chalmers) did not appreciate that. He had been anxious over the dead who died from plague in Glasgow, and wanted to have cremation, but failed. He therefore arranged for the burial under restricted conditions. But even in a body dead twenty-four hours it was very difficult to recover the organism in a virulent condition. It had already undergone considerable degeneration. There were many things in the character of the organism which seemed to determine its virulence.

Mr. HAFFKINE, in reply, said that owing to the lateness of the hour he would deal only with one or two points, viz., with those on which he had been asked for some information. In reply to Colonel Macpherson he said that Dr. Turner, Health Officer of Bombay, had given attention to a plan of protecting houses from fleas by means of naphtha or petroleum products. Certain of his observations appeared encouraging, and the plan was being tried further in Bombay, Poona, and elsewhere. Attention had also been directed in India to the possibility of avoiding flea-bites by oiling the skin with mustard or other oils used by Indians of certain castes. The matter called for close and persevering investigation. Dr. Sandwith had put to him one or two somewhat difficult questions. The first concerned his view as to the difference in the susceptibility to plague of Indians, Europeans and Africans. Somalis, Sidi-boys, Kaffirs, and Europeans of all classes when attacked with plague recovered comparatively easily, whereas in Indians the proportion of deaths to cases was often as high as 70 per cent.; in the other communities it rarely went above 35. From the information kindly given him by Dr. Sandwith, and that which appeared in publications, he concluded that the latter figures held good approximately also for the Arabs in Egypt, at any rate in the case of the endemic form of the disease. The fact that among Europeans inoculated against plague fatal attacks were yet unknown, while in Indians they were observed in a certain proportion of cases, and that in the former the immunity conferred by the

inoculation was apparently of a longer duration, seemed to him to stand in relation to the same differences between the two races. If Africans, Arabs, and Europeans showed these advantages in ridding themselves of the plague infection when the attack was already on them, he surmised that they had the same advantages when struggling with the virus in the incubation stage and endeavouring to ward off the first onset of the attack. Dr. Sandwith had, further, referred to his statements regarding disinfection, and quoted the villages in Egypt where the treatment of native huts with corrosive sublimate had been seen to permanently free them of plague. He attached great weight to Dr. Sandwith's observations, and must plead ignorance of the facts he referred to. As far as his present experience went, he had not known cases pointing to a relation between disinfection and the cessation of an outbreak of plague. He was open to conviction, and held the opposite opinion entitled to attentive and earnest consideration.

Dr. ASHBURTON THOMPSON said, in reply, that it was too late to discuss all the interesting points which had been raised, but he would touch on some of them. Drs. Payne, Simpson, and Chalmers had all declined to admit that the rat was the sole cause of epidemic plague. He would first ask what other cause had reasonably—nay, he would even say had plausibly—been suggested? However, their hesitation rested in reality on negative evidence, namely, the non-discovery of plague rats in certain places. But he had again and again remarked on the difficulty there most often was in detecting disease of the rats on any area; and, while the older observers had no means of identifying the cause of death in any carcasses they may have encountered, in the accounts of more recent epidemics there was no evidence at all that an adequate search for plague rats had been made. Dr. Chalmers went even further. He was able to say that at Glasgow he had found no plague rats in close association with cases; where cases were found there were no plague rats, and where plague rats were found there were no cases. He welcomed that statement, for it represented his own early experiences. But he had had a more extensive and a more prolonged opportunity than had fallen to Dr. Chalmers, who, if he had had the chance, would have found ultimately that his observation, correct though it was, was incomplete; and he would unavoidably have come at last to the conclusion already formally expressed by the speaker, that the plague rat was harmless to man save in the presence of an intermediary agent. Professor Simpson had fallen into one or two inadvertencies which it seemed important to point out, just as in the course of lectures recently delivered by him he had asserted that plague had occurred at Sydney in a mild form—an assertion which was not founded on any fact. Prof. Simpson, in the course of his remarks, had quoted a case in which the speaker had appealed to the agency of the flea to explain the observed facts, as though it had been adduced to establish the agency of the flea; and he had said that this case was about the strongest evidence which the speaker had at any time adduced in favour of the active agency of the flea. But, in fact, the epidemiological evidence for the reality and the essential character of the agency of the flea was of a totally different kind, and had been

set forth four years ago, in the speaker's second report, not in the sixth report from which Prof. Simpson had quoted. However, that was generally known to those specially interested in plague; and after having remarked that his suggested remedy was not the same as Dr. Creighton's, as Prof. Simpson had alleged (for Dr. Creighton thought that the infection of plague was taken with the breath from the ground-air, and not from rats, nor from any source other than that), he would conclude by saying that as he was unable to share Prof. Simpson's views on the pathology of plague, there could not be any common basis of discussion between them. Dr. C. J. Martin's kindly criticism contained the only direct reply to his suggestion which had been made, and for well-known reasons it was entitled to the highest consideration. Dr. Martin had strongly asserted that the rebuilding of India had been demanded, and was evidently impossible. He would remind Dr. Martin of the maxim "*Divide et impera*." That which appeared impossible when viewed as a whole assumed a different aspect when it was regarded in detail: and he thought that if the fact that the infection was present in the concrete form presented by the animal body, in particular places, and was thence by mechanical agencies transported afar, there to form new local centres of infection and distribution, were more carefully considered and dwelt upon, it would be seen on reflection that his recommendation was far from being chimerical.

Epidemiological Section.

January 24, 1908.

Sir SHIRLEY MURPHY, Vice-President of the Section, in the Chair.

Rubella.

By E. W. GOODALL, M.D.

IT is now about 150 years since the suggestion was first mooted that an infectious exanthematous disease existed which was essentially different from scarlet fever and measles, though it resembled them closely in some of its clinical aspects. To this disease many names have been applied, amongst the best known of which are German measles, r  theln, epidemic rose-rash, epidemic roseola, rubeola, and rubella.¹ If these different names had been used invariably of the same disease, perhaps little, if any, hindrance would have been offered to its due recognition. But a study of the narratives of different writers makes it clear that the same name was not always applied to the same disease, and this redundancy of names, their faulty application, and the natural duplicity of the disease itself engendered a haziness which has only within recent years been cleared away. Now, however, with hardly an exception, writers on acute infectious diseases admit the separate existence of rubella; and not only so, but there is amongst them an agreement upon its principal features which is in marked contrast with the diverse descriptions of their predecessors.

¹ The name "rubella" was first proposed by H. Veale in 1866 (*Edin. Med. Journ.*, 1866, xii., p. 404). It does not appear to have been misapplied to such an extent as have the other names mentioned, and is on that account preferable to them. It is the name adopted by most recent writers on infectious diseases. Accounts of rubella (under other names) will be found by Sir B. W. Richardson in the *Epidemiological Society's Transactions*, (1862, ii., p. 1) and Dr. Babington (1864, p. 168), and by Dr. Kenneth McLeod in *New Series*, 1885, iv., p. 52).

Though I have a fairly large experience of most of the acute infectious diseases of this country, I do not happen to have seen very many cases of rubella, but I have seen a sufficient number to be convinced of its distinctness. I made my first acquaintance with it more than twenty years ago at the London Fever Hospital; this acquaintance has been kept up intermittently ever since, but last year (1907) it was renewed with a closer intimacy than before, as will become evident presently. During these twenty years I have not observed any marked change in the clinical aspects of the disease, though as it is given to disguising itself in the garb of some of its more familiar neighbours, I will not say that I have not at times made a mistake and applied to it, and to them, the wrong name.

Rubella is a disease, according to my own observations, of which the following are the most common clinical features:—

Prodromal Period.—Usually none; if present, very short, seldom more than twenty-four hours. Of 85 cases which I saw last year, in 60 the rash was the first, or amongst the first, symptoms. Other prodromes are sore throat, vomiting, enlargement of the lymphatic glands, especially of the neck, and moderate pyrexia. Less frequent are shivering, headache, giddiness, coryza, and pain in the back and limbs.

Rash.—This usually commences on the face and scalp, as discrete pale pink spots, but not infrequently the spots come out on the face, trunk and extremities simultaneously. When the face is first affected, the rash will disappear from it within twenty-four hours, and will then be seen on the trunk and upper extremities; lastly the lower extremities are invaded. The rash involves the skin of the face right up to the lips. In most cases the rash becomes so confluent on the trunk and extremities the day after its appearance as to present a uniform pink or scarlet erythema, which is often punctate. As the rash has by this time disappeared from the face, the resemblance to mild scarlet fever is very striking. Sometimes the discrete spots fade and vanish without becoming confluent; less often they become confluent so as to form irregularly shaped macules, though the macules are not usually so large as those of measles. Still less frequently the rash takes the form of a scarlatiniform erythema on the trunk and limbs from the very commencement, avoiding the face.¹ The duration of the rash is rarely longer than three days; often it is shorter.

¹ Dr. Watson Williams has observed some cases in which a pale halo was to be seen round the discrete spots (*Brit. Med. Journ.*, 1901, ii., p. 1797). I have observed this also, but I have also seen this appearance in cases which were certainly not rubella.

Glands.—The superficial lymphatic glands are often moderately enlarged and tender. Those most commonly affected are the mastoid and posterior cervical, so that some stiffness of the neck results; but all may be implicated. They do not become matted together, and supuration is extremely rare; I have never seen it myself. Of 67 cases last year in which a note was made as to the state of the glands, enlargement was observed in 52. In 18 cases several sets of glands were involved. I have known the mastoid and cervical glands to escape when others have been affected.

Pyrexia.—In 41 cases observed all through the attack, the temperature rose above 99° F. in 15. In 44 cases admitted after the rash had come out, the temperature was above 99° F. in 20. The highest temperature recorded in these 85 cases was 102·8° F. Seldom is the temperature raised for longer than twenty-four hours, during the period when the rash is attaining its greatest intensity.

The *conjunctivæ* are often, but by no means always, injected. In only 29 of the 85 cases is a note made on this point—in 19 the *conjunctivæ* were injected, in 10 they were not. In the cases last year I noticed that the *conjunctivæ* were not so frequently affected as in groups of cases seen in former years. The conjunctival affection causes itching and smarting of the eyes with lachrymation, and occasionally photophobia. Sometimes there is a slight *watery discharge from the nose*, with itching and sneezing.

Desquamation may follow; usually it is slight and branny, but it may be profuse; rarely is it “pin-hole.”

Incubation Period.—My observations on this point are few; such as they are they go to show that the duration of the period is between ten and twenty-one days, commonly fifteen to eighteen.

Rubella does not appear to be a common disease. During the sixteen years (1892 to 1907) that I have been at Homerton I have seen only 287 cases, and some of those may have been cases of measles, especially in the earlier years. On the other hand, it is extremely likely that some sporadic cases have been diagnosed as scarlet fever or some rash which was not specific. The following is the yearly number of cases:—

TABLE I.

	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907
Rubella ...	34	3	0	13	5	31	20	5	33	0	4	13	16	13	2	85
Measles ...	98	31	39	48	25	61	43	56	44	31	30	51	45	36	39	62

These figures, except, perhaps, those of last year, are much too small to give any true indication of the annual prevalence of the disease. Measles is not admissible, as such, to the Asylums Board's hospitals, so that measles and rubella are seen in them only accidentally. Rubella gets sent in as scarlet fever. During the years 1900 to 1902 few scarlet fever cases were admitted to the Eastern Hospital, the wards being required for diphtheria. That circumstance would have affected the numbers of the rubella admissions.

It is quite impossible to obtain an exact knowledge of the prevalence of this disease from literature. Perhaps it is too inoffensive to attract attention, being rarely fatal or even severe, but I gather that it is a disease which occurs in small local outbreaks. Most of the accounts of it are derived from observations of its occurrence in institutions, such as boarding schools and hospitals. It is very likely to be confounded with measles, and an epidemic might easily be merged in one of that disease and so escape notice. The number of measles cases that have been seen annually at the Eastern Hospital are given for comparison in Table I.

Seasonal Prevalence.—My cases have occurred as follow :—

TABLE II.

		Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Rubella	...	15	27	39	47	51	60	27	8	3	1	3	6
Measles	...	72	50	65	57	64	51	71	49	17	32	48	62

The measles figures given in this table are derived from 638 consecutive cases occurring at the Eastern Hospital, analysed according to their monthly incidence. They are included amongst the figures given in Table I.

From Table II. it appears that rubella is most prevalent from March to June.

Climate.—Undoubted outbreaks of rubella have been observed in the British Islands, on the Continent, in the United States, India, Australia, and New Zealand.

Age Incidence.—My 287 cases, arranged according to age, are as follow :—

TABLE III.

		0—	5—	10—	15—	20—	25—	30—	35—	40—	
Rubella	...	121	109	24	10	11	5	4	2	1	= 287
Measles	...	536	95	3	4	0	0	0	0	0	= 638

The youngest patient was aged five months, the oldest 42 years. The large proportion of children aged under 10 is partly accounted for by the

fact that many of the attacks arose in children convalescent from scarlet fever or diphtheria. These constitute about 75 per cent. of the patients in a fever hospital.

Sex.—Of the 287 cases 145 were females and 142 males.

Infectivity.—In my experience the disease does not possess a high degree of infectivity, even when it is more prevalent than usual. It is not as infectious as scarlet fever or measles. Some instances of ward outbreaks at the Eastern Hospital, Homerton, will illustrate this point.

TABLE IV.

WARD F. (19 beds).	WARD H. (19 beds).
January 17.	January 16.
<i>July 3</i> ; July 5–10.	<i>February 11.</i>
July 30.	February 22; <i>February 22</i> ; <i>February 23</i> ; <i>February 26</i> ; <i>March 1.</i>
	March 8–9.
WARD G. (19 beds).	WARD P. (19 beds).
<i>January 23.</i>	February 11.
March 17.	<i>March 16</i> ; <i>March 18</i> ; <i>March 18</i> ; <i>March 21.</i>
April 2.	
April 12; April 17; April 20.	
May 6; May 7.	
May 24.	
WARD F.H. (20 beds).	WARD H.R. (19 beds).
March 1.	February 10; February 13; February 13;
March 16.	February 15.
WARD ST. V. (12 beds).	WARD ST. P. (12 beds).
<i>April 8.</i>	April 18–20; <i>April 19</i> ; April 22.
April 24.	

The date is the date of the removal of the case from the ward. This was within a few hours of the onset of the illness, except where a second date is given (*e.g.*, July 5–10) or when the date is in italics; in these last cases the patients were not moved from the ward at all.

Besides the wards mentioned in Table IV., eight other wards had cases—in five only 1 case, in another 2, and in two others 3. In these last three wards the cases occurred at such intervals or under such conditions that it was quite impossible (without accepting extremely short or extremely long incubation periods in some of the cases) that the first could have caused the others, so that in thirteen instances one case of rubella failed to give rise to another. In all these cases the patient was removed as soon as the nature of the disease was discovered, and was in the ward for a few hours only.

A glance at Table IV. shows that the cases sometimes occurred in little groups of two to five at a time, which were by no means always followed by others, even when the patients were left in the ward. Nor were the cases from which the groups derived infection always to be traced. This incidence quite corresponds with what one finds outside the hospital. I have often noticed two or three cases coming from one house, or institution, or circumscribed locality. For instance, last year a number of children were sent to the Eastern Hospital from a Poor Law school because they were suffering, or supposed to be suffering, from scarlet fever. One girl was admitted with scarlet fever on February 10; on March 1 she developed rubella, and another case arose in the ward on March 16. On March 9 two boys were sent to the hospital from this school suffering from well-marked rubella. I ascertained that there were cases of this disease, as well as of scarlet fever, occurring in this school. One of the nurses and one of my students caught rubella at the Eastern Hospital in 1907.

Rubella is held by most authorities to be a very mild affection. It seldom presents severe symptoms, and is very rarely fatal. But last year one of my patients died of sudden heart failure following a slight attack of arthritis, which appeared to have been due to rubella.

William T., aged 3, was admitted on April 28, 1907, certified to have scarlet fever. It was stated that he had vomited on April 26, and had a sore throat on April 27. The rash had appeared on the 26th. It was also stated that he had previously had measles.

On admission there was a dull, macular erythema on the trunk and a somewhat papular erythema on the arms. The cervical glands were enlarged; the tongue showed some enlargement of the papillæ; the tonsils were enlarged. The temperature was normal; it rose the same evening to 99·8° F., but was normal again next day. The patient was placed in an isolation room; when I saw him again the next day I made the note that the case looked then rather like one of scarlet fever. On May 2 desquamation was noticed on the neck, and on May 3 on the left thigh, of the pin-hole variety; on May 8 the peeling was very free on the trunk and limbs. On May 10 the cervical glands became more enlarged. On the evening of May 12 the temperature, normal up to that day, rose to 101·2° F.; and it continued to be raised (100° F. to 102° F.) till the evening of the 17th. On the morning of the 18th it was normal. It rose again to 100·6° F. on the evening of the 22nd, and was normal again the next day. On May 14 there was pain and some puffiness of both wrists. On the 16th the patient was better. On the 19th he was

doing well. On May 23, at about 2 o'clock in the afternoon, cardiac failure suddenly arose: dyspnoea, cyanosis, vomiting, pulse rapid and soft. The patient was pallid and sweating. The heart was dilated, and there was a loud, blowing systolic murmur at the apex. In spite of the administration of stimulants the child did not rally, and died at 7 p.m.

There was no albumin at any time. A post-mortem examination was made the next day; nothing abnormal was found except an excess of fluid in the pleural cavities and slight dilatation of the left ventricle.

Edward T., aged 4 (William T.'s brother), was admitted on April 30. It was stated that he had had sore throat, headache and rash on April 29, and also that he had previously had measles. On admission there was a morbilliform rash on the face; on the limbs the rash was much faded, but was macular. On the chest was a punctiform erythema. The tonsils were enlarged, but clean. The mastoid glands were enlarged, but no others. The tongue was furred. The temperature was 99.6° F. It rose to 101° F. the same evening; next day it was normal and so continued.

The diagnosis was rubella, and the boy was placed in the same room as his brother. By May 2 the rash had become a faint pink blush. By the 4th it had disappeared. On May 14 there was some desquamation on the thighs and chest. There was never any albumin and not very much peeling. The patient was detained till June 4, because his brother's illness had raised a suspicion of scarlet fever. No note was made in either of these cases as to the presence or absence of Koplik's spots, but I am confident that they were looked for and not found, and that only positive signs were noted.

William T. was suffering either from rubella or scarlet fever. I had diagnosed rubella even before his brother was admitted. Edward T. certainly had rubella. The suspicion of scarlet fever was raised, so far as the medical staff of the hospital were concerned, only when William T. died very shortly after an attack of arthritis. Perhaps the arthritis had nothing to do with the rubella, but was a mere coincidence.

Complications are rare; I have twice seen otitis media amongst the 287 patients, once arthritis, the case of William T., and four times a rash, which appeared a few days after the rash of rubella had gone. In two of these cases the rash was something like that of the primary attack (morbilliform); in the other two it was scarlatiniform. These recurrences of a rash have been described by other writers and are usually termed relapses.

So much for rubella as I have observed it. I have been obliged to enter into clinical details in order to make quite clear the nature of the disease for the purpose of the discussions which follow; but I may add that the description of rubella I have just given does not differ in any essential point from the accounts given by various authorities during the last twenty years.

Now, as I have said previously, the consensus of opinion amongst these authorities is almost unanimously in favour of the separate existence of this disease, and that it is not a mere variety of scarlet fever on the one hand and measles on the other.¹ Clinically some cases of rubella resemble scarlet fever, others measles, in the benign forms of these diseases, so that we have rubella divided into two varieties, the scarlatiniform and the morbilliform. According to my own experience and the written accounts of other observers, the rash of rubella consists very much more frequently of small discrete spots than it does of a diffuse punctate erythema. What very frequently happens is that the rash begins as discrete spots and ends as a scarlatiniform erythema. Still, occasionally it is more or less scarlatiniform all through its course, though such cases are usually accompanied by those which exhibit the spotty rash.

I have spoken of the almost unanimous agreement upon the distinctness of rubella that is to be found amongst modern writers. I can hardly find a text-book published during the last twenty years in which this is not admitted. But Henoch, at any rate in 1889, was doubtful. De Gassicourt, in his work on the diseases of children, does not mention rubella. According to a paragraph in the *British Medical Journal* for December 31, 1898, Dr. Jackson, of the Brisbane Fever Hospital, is no believer in the duality of the two affections, rubella and measles. He states that cases of these diseases were placed together in the same tents during an epidemic, and the patients who were suffering from the one disease did not catch the other. In this country Dr. Donald Hood, in a pamphlet published in 1895 on the etiology of r  theln, expresses his conviction that it is an attenuated form of measles.

It must be admitted that sporadic cases of rubella may occasionally be very difficult to distinguish from measles. But sporadic cases of most

¹ The hypothesis that rubella is a hybrid between scarlet fever and measles has been utterly abandoned, if it was ever seriously held by more than a sprinkling of writers. Like the idea of breeding true, so often used when speaking of infectious diseases, it is based on a false analogy; and the use of these terms has done nothing to advance our knowledge of these diseases.

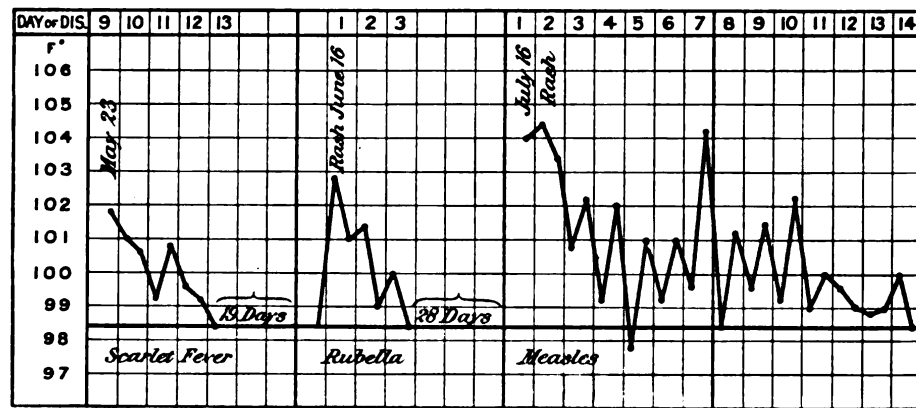
of the common infectious diseases often give rise to difficulties in the way of diagnosis. The picture of rubella given above has not been delineated from a study of sporadic cases. The disease, as I have met with it, often occurs in little groups of cases, which occasionally give rise to others, so that it is infectious, if only slightly. We are not dealing with a disease which may be epidemic and not infectious, such as poisoning by lead or arsenic. But simultaneously with the occurrence of these small groups of cases, sporadic cases of an exactly similar character are met with, which may or may not give rise to others. I have stated above that last year I observed thirteen sporadic cases which failed to infect. The disease is feebly infectious. Not so, however, is measles. If a case of that disease remains in a ward for only a few hours it rarely fails to show its infectious nature, and as often as not, in the course of a few weeks, every patient in the ward who has not had the disease gets it. Ward outbreaks of the two diseases, therefore, are quite different in their behaviour. Their seasonal prevalence is also different. Rubella is a disease of spring and early summer; measles, mostly of the late autumn, the winter and the early spring.¹

The age incidence of the two diseases is also different. Thus, of the 638 consecutive cases of measles analysed in Table III. only 7 were over 10 years of age (1 per cent.), while of the 287 cases of rubella, 57 (20 per cent.) were over 10 years. The figures dealt with are small, but they are drawn from the same environment. Again, measles is a fatal affection—sometimes it is very fatal—and it is prone to be accompanied or followed by complications. Rubella is rarely complicated, and is hardly ever fatal. Each of the diseases protects against itself, but not against the other. I have on five occasions seen a patient undergo attacks of rubella and measles within a few weeks. I give the temperature chart of one case (*see* next page). The child, a girl, aged 3, was admitted on May 23, 1892, towards the end of a sharp attack of scarlet fever. When she was convalescent, first rubella, and shortly afterwards measles, broke out in the ward, and four patients, convalescent from scarlet fever, of whom she was one, caught both diseases within a few weeks. I may add that at the time the ward contained about thirty patients and was much overcrowded.

But those who disbelieve in the existence of rubella might argue, and might reasonably argue, that none of these points are sufficiently strong to establish the disease. They might say, "What you call rubella is

¹ See a paper by Dr. G. N. Wilson in *Public Health*, Lond., 1905-6, xviii., p. 65.

really only mild measles, which attacks adults more often than you suppose. Nor do we admit that second attacks of measles are so uncommon." Certainly cases of measles are occasionally so benign as to have hardly any febrile symptoms and very little rash. But with respect to the other points, Dr. Wilson, in the paper already referred to, found that of the 40,000 odd cases occurring during twenty consecutive years at Aberdeen, only 5 per cent. were over 10 years of age; and that second attacks took place in 2 per cent. of 24,000 odd cases notified in ten consecutive years. No attempts appear to have been made in the Aberdeen cases to distinguish between rubella and measles, but Dr. Wilson hints that rubella may have been responsible for some of the supposed second attacks of measles. Still, we have to rely, and in sporadic cases we have entirely to rely, upon the clinical symptoms to



spots are of the utmost diagnostic importance. It is very seldom indeed, in my experience, that they are absent from a case of measles, certainly in less than 5 per cent. of the cases.¹ Now I have read through the notes of the 85 cases of rubella I saw last year at the Eastern Hospital. In 56 of these cases a note was made that these spots were absent. In the rest of the cases no note was made concerning the spots, almost certainly because the reporter did not think it worth while to record a negative observation. I may say that I examined nearly all the 85 cases myself, because it is my practice to inspect all cases of this kind for the purpose of directing where, if necessary, the patient is to be isolated. I can therefore affirm with certainty that not only the 56 but the remaining 29 cases did not show Koplik's spots. Had they done so, they would have been isolated at once, (a number of them were not), because measles is not only a very infectious but also a serious disease, and they would have been diagnosed as measles and not rubella.

Now, if all these cases were cases of measles, then we have to admit that cases of measles without a prodromal period, with a certain kind of a rash, with a very mild course, and without Koplik's spots, that is to say exceptional cases of measles, give rise not only to sporadic cases, but also to outbreaks of cases of an exactly similar, that is to say exceptional, kind. That is not my experience of measles. Even the mildest cases of measles present Koplik's spots, and even though the general character of the cases in any given epidemic or outbreak of measles may be mild, yet you do see amongst them some severe, and perhaps even fatal, cases; and a mild case may give rise to a severe case, and a severe to a mild. And so it is with any acute infectious disease which is commonly capable of being at all severe.

Another fact I may mention. I noticed last January and February that cases of rubella were occurring with unusual frequency for the season of the year. I saw 7 cases in January and 20 in February, besides some suspicious cases. I ventured to predict to my class of students that there would be an unusual prevalence of the disease in the spring and summer, and the event proved that I was right. My prediction was based upon what may be called almost a law of epidemic diseases which have definite seasonal prevalences, that if the prevalence

¹ L. Falkener found them in all of 59 consecutive cases of measles, and failed to find them in 28 cases of rubella. They were present in all the 62 cases of measles occurring at the Eastern Hospital in 1907. Falkener also searched for them in a large number of cases of acute diseases of various kinds, without success. See *Met. Asyl. Board's Reports*, ii., 1899, p. 198.

begins to be noticeable rather earlier than the usual period, then you may expect an unusual number of cases during that period. But I do not pride myself on being able to predict the prevalence of an unusually mild and altogether exceptional sort of measles, which I should have been doing if rubella is merely benign measles. The population amongst which these cases occurred is not such as will afford measles of a modified variety in any large number.

I hold, therefore, that even in sporadic cases there is, as a rule, little difficulty in distinguishing rubella from measles.

Another aspect of the subject must now be considered. I have been dealing with those who say there is no such disease as rubella. There are those, on the other hand, who, far from denying the existence of rubella, assert that under this name two diseases have been described, of which one may be called rubella and the other is not rubella, nor measles, nor scarlet fever. It was, I believe, Filatow, in 1885, who was the first to affirm that the so-called morbilliform and scarlatiniform varieties of rubella are two distinct diseases, and some such idea was in the mind of more than one observer before the year 1900, when Dr. Clement Dukes published his paper "On the Confusion of Two Different Diseases under the name of Rubella (Rose-Rash)," ¹ and proposed, tentatively, the name "Fourth Disease" for the affection which was not measles, nor scarlet fever, nor rubella.

I think that it is extremely probable, if not absolutely certain, that there are other acute infectious exanthematous diseases, as yet little known, besides scarlet fever, measles, and rubella. I find in a recent text-book ² an account of a disease called *Erythema infectiosum*. Escherich was the first to differentiate it in 1897, but it had previously been described as a local variety of rubella (örtliche Rötheln) by Tschamer, of Gratz, in 1886. It seems to have been observed chiefly in Germany. The same disease has also been called *Megalerythema epidemicum*. ³

Then we have the epidemic, recorded by Dr. R. A. Dunn, in Hertford and East Essex during the winter of 1904-5. ⁴ But none of these accounts brings conviction to the reader that the disease is a new one, with the exception of infectious erythema. This disease appears, according to the descriptions, to be clinically quite different from scarlet fever, measles, rubella, and even the hypothetical fourth disease. I have seen

¹ *Lancet*, 1900, ii., p. 89.

² "A System of Medicine," edited by Professors Osler and McCrae, 1907, ii., p. 399.

³ See a paper by Cheinisse, *Sem. méd.*, Paris, 1905, xxv., p. 205.

⁴ *Brit. Med. Journ.*, 1905, ii., p. 421. Republished separately with additions, Oct., 1905.

a few cases resembling the description given by the writers to whom I have referred, but they were sporadic, and I obtained no evidence that they were infectious.

Epidemics, apparently due to milk contaminated in some way or other, have also been recorded, in which the chief symptoms were sore throat, fever, and an erythematous rash, which was not like that of scarlet fever, or measles, or rubella. But in these outbreaks the disease was not supposed to have been communicated from the sick to the healthy, unless by means of milk; the disease was not infectious in the ordinarily accepted meaning of the word.

The Hertford epidemic resembled in some cases scarlet fever, in others influenza, in others meningitis, and in a few typhoid fever. And, as one reads Dr. Dunn's account, the question arises, Might not this have been an instance of the simultaneous occurrence of more than one epidemic acute disease? I call to mind an outbreak I had an opportunity of investigating from the clinical point of view a few years ago. All the cases, 122 in number, could be divided into three main groups, typhoid fever, acute pneumonia, and indefinite febrile attacks, with or without diarrhœa, but not typhoid fever. Yet this mixed outbreak was limited to the population of a lunatic asylum with some 2,250 inmates, including the staff, and it was shown that the water supply was contaminated by sewage.¹

With Dr. Dukes's "fourth disease" I must deal at greater length, since the question of its separate existence is intimately connected with the subject of this paper. I understand from his accounts that Dr. Dukes believes that what other observers call the scarlatiniform variety of rubella is really quite a separate disease. At any rate he will not admit that the rash of rubella is ever scarlatiniform from its first appearance. I cast in my lot with those who believe in the scarlatiniform and morbilliform varieties of rubella, though in my own experience the former is not very common. Some half dozen of the 85 cases I saw last year had a rash which many an observer would have called scarlatiniform from the commencement. But these occurred with others of the ordinary morbilliform variety. I have recently read again most carefully Dr. Dukes's original paper, and also his articles on "Rubella" and "Scarlet Fever" in the "Encyclopædia Medica." In his original paper he refers to three outbreaks in boys' schools; the first and third he believes to have been "fourth disease"; the second to have been one in which scarlet fever and "fourth disease" were occurring simultaneously; some boys

¹ *Met. Asyl. Board's Reports*, 1899, ii., pp. 181 and 186.

suffered from one of these diseases, some from the other, and some from both. Now, in my opinion, a different interpretation may be given of these outbreaks without any straining of the evidence brought forward by Dr. Dukes, namely, that the first and third were mild scarlet fever, and the second a mixed outbreak of scarlet fever and rubella, mainly of the scarlatiniform variety. It appears to me that Dr. Dukes lays too much stress on two points. The one is the supposed infectivity of the desquamating cuticle at a late stage of scarlet fever. Because certain boys went home, still peeling, two or three weeks after the commencement of their illness, and did not give rise to other cases of scarlet fever, therefore the disease was not scarlet fever. He has evidently forgotten Dr. Priestley's experience at Leicester some years ago,¹ when though "not less than 120 children in various stages of desquamation after scarlet fever were sent to their homes, no single second case occurred at any of these homes," although Dr. Priestley carefully watched them for three months. The other is the invariability of Cullen's law. The exceptions to this law are, I believe, more frequent in the case of scarlet fever than Dr. Dukes would admit. We know, indeed, that for some diseases this law does not exist, *e.g.*, influenza and pneumonia.

In his original paper Dr. Dukes states that the rash of the "fourth disease" is indistinguishable from scarlet fever. In his article on "Scarlet Fever" in the "Encyclopædia Medica"² he gives an elaborate table setting forth the characteristics of rubella, "fourth disease," and scarlet fever. The table is arranged in three columns, and extends to four pages. The following is the description of the rash of the "fourth disease": "(8) The eruption is usually the first noticeable symptom, and will cover the whole body with a considerable diffuse rash in a very few hours. The hue is a bright rosy red, and the eruption is raised somewhat from the surface of the skin. The sensation of heat of the skin to the touch, even where the rash is very full, is much slighter than in scarlet fever." One asks what sort of a diffuse rash: macular, papular, punctate, or uniform? Also, is the face affected, and the limbs, or only the trunk? The distinctions drawn by Dr. Dukes in this article between rubella, "fourth disease," and scarlet fever are extremely artificial, and I venture to assert that in practice they would break down frequently. Reading carefully through the three columns one cannot find that any feature has been clearly

¹ *Epid. Soc. Trans.*, 1895, new series, xiv., p. 73. See also paper by Dr. Millard, *Epid. Soc. Trans.*, new series, xxi., 1902.

² Vol. x., p. 503.

established to distinguish the supposed "fourth disease" from mild scarlet fever, on the one hand, and rubella on the other.

Dr. Dukes's contention has received a certain amount of support. I can refer to papers by Dr. F. T. Simpson¹ and Mr. J. J. Weaver.² Dr. Simpson's account is based on 27 cases which occurred in a school for the deaf, Hartford, U.S.A., in the spring of 1901. But here, again, the interpretation that some of these cases were rubella and others scarlet fever is quite an adequate one, and by no means forced; and as a matter of fact the diagnosis was changed two or three times during the epidemic. Mr. Weaver describes 13 cases. The descriptions are not as full as one could wish. The cases may be divided into two groups, one made up of those cases admitted to the fever hospital at Southport as scarlet fever, but supposed really to be suffering from "fourth disease," and the other of those admitted with scarlet fever and catching the "fourth disease" in the hospital. In one of the latter group the rash is described as consisting of "small scattered red spots, appearing first on the face, then spreading over body and limbs, and gradually declining," and in three others it is stated that the rash appeared first on the face.

It is perfectly clear that what Mr. Weaver had to do with was scarlet fever and rubella. The cases of so-called "fourth disease" admitted to hospital were evidently cases of rubella in a late stage, when the rash had disappeared from the face and become scarlatiniform on the trunk. It may be mentioned as bearing on the value of the evidence that the descriptive notes of some of the cases were made by the nurse at the hospital, from which we may conclude that Mr. Weaver did not see them at the time they were admitted. As for the cases which caught "fourth disease" in hospital, a rash which begins on the face as scattered red spots is very different from the erythema of the "fourth disease," which, according to Dr. Dukes, is indistinguishable from the rash of scarlet fever; and yet we find Dr. Dukes appealing to Mr. Weaver's account in support of his own views!³ Whatever he may have observed, it is quite clear that Dr. Dukes has not succeeded in conveying to his readers a clear idea of the clinical characters of his "fourth disease."

¹ *Archives of Pediatrics*, xviii., p. 692.

² *Dub. Journ. Med. Sci.*, 1901, cxi., p. 416; *Journ. State Med.*, 1901; *Public Health*, Dec., 1901; and *Brit. Med. Journ.*, 1902, i., p. 364; but these papers all refer to the same group of cases. I quote from that in the Dublin journal.

³ Article on "Rubella," *Encyclop. Med.*, x., p. 470.

But of the few supporters of Dr. Dukes the most able is Dr. Cheinisse.¹ In an article which contains a very full bibliography of the subject he establishes the existence of the "fourth disease" to his own satisfaction, and proposes for it the name "epidemic pseudo-scarlatina." A considerable portion of the article is devoted to urging Filatow's title to priority of discovery, for, as I have previously mentioned, the Moscow physician was the first to believe that the so-called scarlatini-form rubella was not rubella at all. If, however, time shows that the "fourth disease" does really exist, to Dr. Dukes will certainly be due the merit of having independently discovered it. But I am not at all satisfied with the nature of Cheinisse's arguments nor the validity of his conclusions. For instance, though the article is a critical review, while he quotes with considerable fulness from papers which are in favour of "fourth disease," he hardly does more than refer to the very destructive criticisms that these papers have evoked. He refers to Mr. Weaver's paper, but does not appear to have noticed that Mr. Weaver was describing as "fourth disease" a malady with a spotty rash. And yet Cheinisse insists upon it that "fourth disease" ought rarely to be confused with measles or rubella, though it may easily be mistaken for scarlet fever. I have not been able to obtain Filatow's original papers, but Cheinisse gives some long extracts from them, and it does not appear to me that Filatow really succeeded in demonstrating that this supposed new disease was not mild scarlet fever; nor have any subsequent writers, for some of whom it is quite enough that cases, which are clinically exactly like mild scarlet fever, shall not peel to convince them that they are not dealing with scarlet fever.

I have been on the look out for this "fourth disease" for years past, but have so far not been able to satisfy myself that I have seen it. Nor has anything I have read brought conviction to my mind.

¹ *Sci. med.*, 1905, xxv., p. 145.

Rubella : its Identity and Etiology.

By H. E. CORBIN, D.P.H.

ALTHOUGH it is believed by some writers that this disease was recognised by the Arabian physicians, there is no recorded observation of the disease as a third specific eruptive fever distinct from measles and scarlet fever until De Berger described it in Germany in 1752. The older descriptions of the disease vary considerably, and Formey states that between 1784 and 1796, 1,180 deaths occurred in Berlin from this disease, while during the same interval 203 deaths occurred from scarlet fever and only 103 from measles, but he describes the disease as very severe, with often a white coating in the throat, vomiting, and severe nervous symptoms. Another writer describes the eruption as consisting of miliary pustules.

The disease as we know it was more accurately described in the beginning of the nineteenth century as an eruptive fever running a benign course and characterised by an exanthem which could not be regarded as either measles or scarlet fever, and which many writers at this time maintained to be a hybrid between the two. Some regarded the disease as the outcome of an exhausted epidemic of scarlet fever. The disease is first accurately described in England by Maton in the *Medical Transactions of the College of Physicians*, London, 1815. He says that, "having several times seen cases called either scarlatina or measles in which the symptoms were trivial, and the external characters insufficient to decide their nature, he determined to carefully scrutinise all similar cases." He describes a small epidemic of 8 cases.

The first case, a girl aged 13, on August 18, 1813, had this rash; her face suffused with innumerable points, but she did not feel ill. A sister with her complained slightly and had some fulness of the small cervical glands; next day she had a rash. In the room with these two sisters were four others of the family, aged between 10 and 17; two of these had the rash on September 4 and 5, and the other two on September 7. Two other relatives, the eldest brother, aged 24, and his infant son, aged 1½, were taken on September 24 and 30.

Dr. Maton says: "There is only one other exanthem that I know to which these cases can be considered referable, that is roseola; but tumours do not occur in roseola, nor is it infectious. The period

intervening between the application of the infectious influence and the commencement of the disease was considerably longer than has been noticed in scarlatina. Hence it seems requisite to form a new designation which, however, I do not venture to propose, at present being satisfied with calling the attention of my colleagues to the subject." In this early description the main characteristics of the disease are summed up, namely, the contagious nature, the long incubation, and the enlargement of the small cervical glands.

Cheadle describes an epidemic of unusual severity which occurred in November, 1879, following an epidemic of measles, December, 1878. Of 30 cases in 1879, 22 had suffered from measles, and these protected individuals took the disease just as readily and suffered equally severely with those who were exposed to the infection for the first time. He says: "It seems impossible to avoid the conclusion that the disease in the second epidemic was rubeola, which exists not only in the slight and unimportant form generally recognised, but as an eruptive fever of considerable severity which may assume a dangerous and even malignant type. No other hypothesis will satisfactorily explain the facts. Eight of the cases had had scarlet fever."

From the above descriptions we may gather that the disease does not always conform to the mild type with which we are acquainted, and that many and wide variations may have occurred in the epidemiology of this disease; but on account of the confusion in the earlier days of this disease with the other eruptive fevers, it is probable that some of the older writers were describing quite another disease under this name.

The disease appears to be fairly universally distributed. First called attention to in Germany, it has since been described by many writers in England and France, by Cuomo in Italy, by McLeod in India, and it is well recognised in both North and South America.

It is generally accepted that rubella is an infectious disease and that it occurs chiefly in epidemic form, that these epidemics occur independently of either scarlet fever or German measles. The disease is interesting on account of its frequent occurrence in the form of small isolated epidemics in institutions, especially schools, homes for children, and large business houses. The extent of these epidemics seems to be determined by the quantity and nature—especially with regard to age and previous protection by attack—of the inflammable material.

Dr. Lemprière, medical officer of Haileybury College, has been kind enough to supply me with details of an epidemic which occurred in that school in the Easter term of this year. Of 422 boys in the school, 332

were unprotected by a previous attack of rubella. The number of cases which occurred was 152, being 35 per cent. of the whole school and 45·7 per cent. of unprotected boys. At the same time there was an epidemic of measles in the school, in which 76 out of 118 boys previously unprotected by an attack of measles developed measles, or 64·4 per cent. In only two cases was there any doubt between the diagnosis of rubella from measles.

An epidemic occurred in a large business house in London, the first case being admitted into the London Fever Hospital on February 3, 1907, with an undoubted attack of rubella. Two cases, contacts of the first, came in on February 18, one on February 19, two on February 20, and two more on February 21. There was an interval from this to March 3, when cases came from this house from day to day until March 17, 22 cases in all, or about 7 per cent. from a total of about 300 individuals freely intermingling. The lesser extent of these epidemics in large business firms, compared with those in schools, may be attributed to the smaller susceptibility of adults and to some extent to previous protection, though it was impossible for me to determine the proportion of unprotected individuals.

It is interesting to know that both rubella and measles are admitted into the same wards at the London Fever Hospital, and that, during the last two years, not one patient with either of these diseases has developed the other. It must be borne in mind that a large proportion of the cases of rubella are protected from measles by previous attacks, and that they are young adults who have most probably been exposed to the infection on many previous occasions. Of 202 cases of rubella admitted during 1907 to the London Fever Hospital 76·7 per cent. had had measles and many others were uncertain. Moreover, the cases are kept in bed until the catarrhal symptoms and rash have disappeared.

The degree of contagiousness of rubella has been much discussed, and I am inclined to believe that it is at its maximum during the short prodromal period of usually twenty-four hours which occurs before the eruption is manifest, and that it declines rapidly during the following twenty-four hours, disappearing entirely at the end of this period unless faucial catarrh persists. There is little doubt that the question of age enters much into the question of susceptibility, as shown by a comparison of epidemics in schools and institutions for adults. And this is perhaps more important than previous protection by the disease. During the last ten years sixty-two nurses have been engaged in nursing this disease at the London Fever Hospital. Of these only eight developed

rubella, and while most of these nurses who were unprotected from measles by a previous attack developed this disease, so far as I have been able to ascertain none of them had suffered from rubella before.

It is generally stated that rubella is a disease of childhood, but the large majority of cases admitted to the London Fever Hospital are young adults. This is because the patients are mainly drawn from large business firms and from the servants of private families, but the figures are interesting as showing that the disease is commoner among adults than is generally supposed.

The following table shows the age distribution of 1,523 cases of rubella admitted to the London Fever Hospital during the years 1887 to 1907:—

Under 5 years	...	...	...	...	12
Between 5 and 9	...	...	...	...	23
„ 10 „ 14	...	...	...	...	38
„ 15 „ 19	...	...	...	...	385
„ 20 „ 24	...	...	...	...	652
„ 25 „ 29	...	...	...	...	275
„ 30 „ 34	...	...	...	...	87
„ 35 „ 39	...	...	...	...	25
„ 40 „ 45	...	...	...	...	15
„ 45 „ 49	...	...	...	...	3
50 years and over	...	...	...	...	8

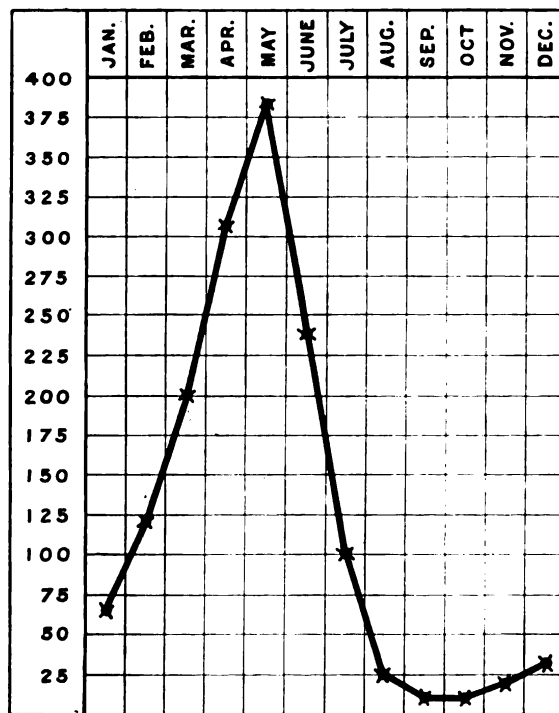
The youngest case I have seen was aged nineteen days. The child was born on July 7, 1907, and admitted with its mother to the London Fever Hospital from a lying-in hospital on July 22. The mother on admission had a temperature of 100·6° F., a well-marked discrete papular rose-coloured eruption on the face, trunk and arms, accompanied by slight catarrhal symptoms and enlarged tender posterior auricular glands. The baby took the breast well, and appeared quite well until July 27, when it became fretful, temperature 99° F. to 100° F., and occasionally sneezed. The posterior cervical glands were enlarged. On the following day the face and body became covered with small discrete bright rose-coloured papules. Highest temperature 100·4° F. On the morning of July 30 the temperature was normal, and the child quite well and again at the breast.

Scholl reports a case of an infant with rubella a few days after birth, the mother having had the disease two months before. Seitz has seen a case aged 73. The oldest case I have seen was aged 56.

The sex distribution in the 1,523 cases is: males 775; females 748.

With regard to the seasonal incidence of rubella, it is essentially a disease of the spring months, nearly 75 per cent. of the cases occurring

between March and June, reaching a maximum incidence in May. In this respect it contrasts markedly with measles, in which there does not appear to be any constant seasonal incidence, although the *mortality* curves, derived from the Registrar-General's reports of the last fifty years, show a double seasonal maximum in June and December, but the incidence of the disease does not run parallel with the case mortality because, during the warm summer and autumn months, the disease is less fatal.

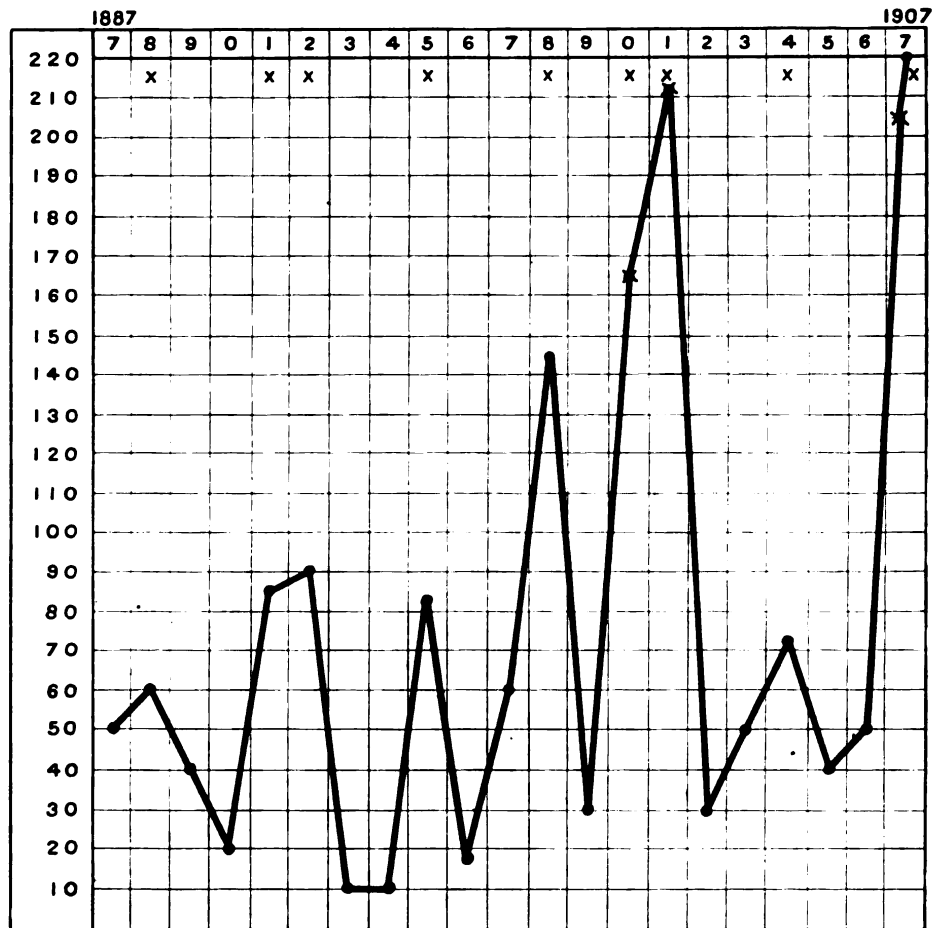


Curve showing Seasonal Incidence of 1,523 cases of Rubella.

From the curves showing the number of cases admitted to the London Fever Hospital it will be seen that there are alternate epidemic and non-epidemic years as in the case of measles, and that, considering the incidence of the disease during the twenty-one years preceding 1908, an epidemic of greater or less magnitude occurs every third or at the most every fourth year.

I have attempted, by plotting on the same chart the number of days of rainfall per month, the inches of rain and the mean temperature, together with the relative humidity, extending over a series of twenty

years, to associate some relation of these with the incidence of the disease, but have not been able to establish any definite climatic conditions which favour the development of rubella epidemics, although it seems that a rising temperature of the air, together with a lowering of the relative humidity and a small rainfall, combine to favour the spread of rubella.



Annual number of cases of Rubella admitted to the London Fever Hospital
between 1887 and 1907.

I will now briefly review the facts upon which the identity of rubella as a disease *sui generis* is established. It is characterised by certain definite clinical phenomena which, though they may be said to resemble in certain respects and to overlap those of measles and scarlet fever,

yet when considered collectively constitute a syndrome which is entitled to independence. It can be only those who have not had an opportunity of observing many cases, or who attach too great importance to the appearance of the rash in the specific fevers and fail "to grasp the sorry scheme of things entire," who still regard the disease as a bastard and a hybrid of two diseases or refuse to grant it an independent existence. The short period of invasion and the long period of incubation differ markedly from the other exanthemata. Its seasonal incidence differs from that of measles and scarlet fever: it is essentially a disease of spring and early summer. The mortality from the disease is practically *nil*. In the 1,523 cases at the London Fever Hospital there was not one death, but it must be remembered that the age distribution of these cases is not typical. Edwards, in the *American Journal of Medical Sciences*, 1884, lxxxviii., p. 448, describes six deaths in 166 cases. Squire says that "where a mortality is reported as high as 3 per cent. of those attacked, measles is present."

Rubella breeds true, and is in no way modified by a previous attack of measles or scarlet fever, even though in some cases only a short interval occurs between the diseases. One such case may be mentioned here. A nurse went on duty in the measles ward at the London Fever Hospital on May 3, 1907. On May 15 she was attacked by well-marked measles—Koplik's spots and severe bronchitis being present. She was discharged on May 27, and on June 1 developed a typical attack of rubella.

No immunity from rubella is conferred by a previous attack of measles or scarlet fever. Of 202 cases of rubella admitted during 1907 I was able to get a history of a previous attack of measles in 155 cases, or 76·7 per cent.; of scarlet fever in 58 cases, or 28·7 per cent.; and of both of these diseases in 18 cases, or nearly 9 per cent. Recurrence of rubella in the same individual is probably rarer than a second attack of measles.

On account of the dual appearance of the rash in rubella it has been suggested that two diseases are included under this head. Filatow first called attention to the matter in 1887, and described the scarlatini-form variety of rubella as a separate disease under the name of scarlatinéole or pseudo-scarlatine. Dr. Clement Dukes, in 1894, says: "I have frequently raised this question, but I have signally failed to establish one relevant fact to sustain the hypothesis. It must be a remarkable coincidence, if such be true, that after so many years of close observation and investigation I am unable to record a single case pointing to this fact." In 1901 he maintains that he has adequately proved the existence of two

clearly distinguishable diseases under the name of rubella, one of which he has termed "the fourth disease." In his description Dr. Dukes attaches considerable importance to the periods of incubation, which even in an epidemic of one disease is difficult enough to obtain, but in a mixed epidemic such as he describes must, in my opinion, be too difficult to be reliable, especially as it is a matter of common observation that an individual may be long exposed constantly to an infection before the disease occurs. Many nurses, for example, are exposed to infection in a scarlet fever ward for an indefinite period before they develop scarlet fever, if they do at all.

Dr. Dukes describes an epidemic of "fourth disease" only which occurred at Rugby affecting nineteen boys, none of whom had previously suffered from scarlet fever, and in whom in this unmixed epidemic he was unable to determine the incubation period. His description of these cases corresponds very closely with many cases of scarlet fever admitted into the scarlet fever wards of the London Fever Hospital, the notes of which I should like to submit in detail if time permitted. None of these cases which would correspond to Dr. Dukes's description of "fourth disease," and which I have admitted into the scarlet fever wards, ever caused the disease in other patients or contracted scarlet fever themselves, a fact which could only be accounted for by one of the following assumptions: That the disease is not infectious, or that each confers an immunity from an attack of the other disease. I have never seen a case of the "fourth disease," and I am inclined to attribute Dr. Dukes's success in dealing with epidemics of the so-called "fourth disease" to the fact that the desquamation *per se* of scarlet fever is very feebly if at all infectious.

In conclusion, I have to express my gratitude to Dr. Sidney Phillips and Dr. William Hunter for kindly allowing me to refer to many of their cases, and also to thank Dr. Sidney Haynes for information concerning a small epidemic of rubella which recently occurred at Stansted, in Essex.

DISCUSSION.

The CHAIRMAN (Sir Shirley Murphy) remarked that both the papers were very interesting and valuable. There was a difference in the age incidence of the disease as shown by the figures of Dr. Goodall and Dr. Corbin respectively. In Dr. Goodall's paper it was said that the maximum number of cases occurred under five years of age, whereas in the other paper it was shown that the maximum number occurred between the twentieth and twenty-fourth years of life. Dr. Corbin had referred to the matter in relation to the

class of patients received at the London Fever Hospital. The question arose, Was rubella so common a disease that, amongst the poor especially, the majority of people suffered from it without knowing it? Was it that it attacked the poor when they were very young, and that in the better circumstanced, who were better defended against attack, it occurred in older subjects? Or was it that Dr. Corbin's cases were largely derived from houses of business and hotels, where the clientèle consisted largely of young adults? He did not think those questions could be answered from material contained in the present contributions.

Dr. Corbin had shown a very interesting diagram showing intervals of three or four years between successive epidemics. This was in accordance with what was observed years ago in regard to measles, before there was such an aggregation of population as now obtained. Therefore, although Dr. Corbin's patients might be enjoying the advantages of a better social condition, it only left them to be attacked after all at a time of general prevalence of the disease. Dr. Goodall's patients, including the very poor, acquired the disease early in life, owing to the lack of safeguards against catching it. Years ago he was engaged in considering the question of the provision which should be made for children entering industrial and reformatory schools, and one of the first wants, he thought, was some place where the children could be quarantined in the event of their being found to be suffering from infectious disease. But he later discovered that to be unnecessary, because these children had practically always passed through everything of the kind in quite early life. He did not deny that the different class from whom Dr. Corbin received his patients had a different age distribution, and that might also affect the result.

Dr. RANSOME, in response to the Chairman's invitation to speak, said he did not feel competent to criticise the papers, from which, however, he had derived much instruction. He thought Dr. Corbin had explained the point about the different age incidence; in the one case this incidence resembled that of measles more than in the other, and that might have something to do with the different class of patients from whom the statistics were derived. He remembered reading a paper before the Epidemiological Society on epidemic cycles, from statistics for 100 years, which he got from Dr. Berg, of Stockholm. It appeared that in the sparsely populated country of Sweden the periodic cycle was distinctly longer than in England, where the population was much more dense. It might be, therefore, that there was a greater condensation of susceptible people in the case of one set of statistics than in the other. He did not see how a thing of that kind could be decided without taking a whole nation; statistics taken from one or other fever hospital would not solve the question.

When he was in general practice he was early convinced of the existence of rubella, and that it was absolutely distinct from measles. A short time ago, when staying at Mentone, he had an instance of that. A young friend of his had an attack of typhoid fever at San Remo, and he found that the sister, who had been a nurse probationer, had been through an attack of what was called German measles. She came out straight away to nurse her brother with

typhoid fever, and in another fortnight he developed measles. Then she got an attack of German measles afterwards.

Dr. CAIGER thought no one who had listened to the papers could help endorsing the Chairman's opinion as to their value. They represented a summary of opinions drawn from the observation of many hundreds of cases, by men who had special opportunities for observation. In the past the actual existence of the disease had been much disputed, and even now there was uncertainty in some quarters. Dr. Goodall's experience in the matter extended over sixteen years, and the cases of which he spoke had been under his own personal observation. Dr. Corbin had given records of an institution which was far and away the most important in respect to rubella in this country, and it would be admitted that the amount of that disease to be found at the London Fever Hospital was unexampled. Two hundred cases were admitted there during the past year. That high incidence, which had been mentioned by both authors, was only part of a larger incidence which had been noticed all over London, and, from certain information he had, in most provincial towns also. In his own hospital at Stockwell, instead of having twenty or thirty cases during the year, the number under treatment in 1907 was eighty or ninety.

What he wished to say was from a clinical standpoint, and by way of supplement rather than of criticism. Dr. Goodall noted that there was usually an absence of prodromal symptoms, and that if present they did not last more than twenty-four hours. He then said that among the symptoms were sore throat, vomiting, enlargement of the lymphatic glands, especially of the neck, and moderate pyrexia. His own opinion was that the vomiting was there unduly emphasised. His view was that vomiting was an excessively rare and early symptom in rubella, and when remembering how frequently vomiting was an early symptom of scarlet fever, that fact was of great value. Dr. Goodall said that the macules, though discrete at an early stage, were apt to become confluent, and were not, as a rule, so large as those of measles. The point to emphasise there was that the macules were discrete at an early stage, and that did not apply to the same extent to measles. He had not convinced himself that the crescentic arrangement of the macules was more often seen in measles than was any other shape. All the points of difference between German measles and true measles should be paid attention to, considering the difficulty often experienced in differentiating individual cases. The rubella eruption began in the form of spots which were smaller and pinker than in measles; they were more discrete, more likely to spare the face, more transient, and therefore caused less staining, and they were followed by more desquamation. They were differences of degree, not of kind, hence the great difficulty which sometimes arose. The stiffness of the neck mentioned by Dr. Goodall he thought should be regarded as essentially a sign to be seen in adult patients. In children it might exist and not be complained of; but the adult would often complain of that before any other symptom. In the epidemic last year one of the things which struck him was the absence of definite enlargement of the cervical lymphatics, which was such a characteristic feature of the disease.

There was an epidemic type of rubella, just as in other diseases. It was satisfactory to him to see that in Dr. Goodall's cases there was a rise in temperature in only 33 per cent. He (Dr. Caiger) had felt that so strongly that he had taught for several years that an increase of temperature was the exception rather than the rule. Dr. Goodall said the conjunctivæ were often, but by no means always, injected. He (Dr. Caiger) believed that when the conjunctivæ were definitely affected in rubella it was part of the hyperæmia of the face generally. The same applied to the nasal mucous membrane. Where the patient complained of heaviness in the head, as if he had a cold coming on, there was perhaps a vivid flushing of the face and injection of the conjunctivæ. Dr. Goodall said: "Desquamation may follow; usually it is slight and branny, but it may be profuse—rarely is it 'pin-hole'"; and Dr. Caiger could endorse that. As a rule, the desquamation in German measles tended to be more distinct than in ordinary measles, but in certain cases there might be absolute pin-hole desquamation, as in scarlet fever. He remembered the case of a medical practitioner in the neighbourhood of Stockwell Hospital, who was not in good circumstances, and asked Dr. Caiger to see him, as he had a vivid erythema and sore throat. He concluded it was German measles, but felt anxious as the patient began to peel in a way which was far above the average. But he adhered to his diagnosis and allowed the patient to go about his practice, wearing gloves, at the end of a fortnight. As far as could be ascertained, no bad results accrued. That required considerable confidence in one's opinion.

He agreed that rubella did not possess a high degree of infectivity, and the fact had an interest for him because of the experiment which had been in force at Stockwell Hospital last year, namely, treating patients with different infections in cubicles in the same ward. During last year sixty or seventy cases of rubella were treated in the same ward as other diseases, shut off only by a glass partition, the ward being ventilated as a whole, and only two secondary cases of rubella had occurred in the ward: in one of those cases it was possible that the child came in incubating; seeing that there was a very hard run of cases throughout that time, this was a very satisfactory result. But it was not such a fine record as Dr. Corbin showed in connection with the London Fever Hospital, and it was with the greatest surprise that he learned that 200 cases of rubella, and many cases of measles, were treated at the London Fever Hospital without a single accident. He did not know why that should be; it almost seemed to dispose of the suggestion that rubella was an infectious disease. It was true that the age incidence of rubella and measles patients did not quite correspond; again, a good many of the rubella cases might have had measles in early childhood, and no doubt the greatest care was taken at the London Fever Hospital; but in spite of those facts, he did not see how Dr. Corbin was going to explain the absence of any accident. It bore out the suggestion that the infectivity of rubella was very much higher at the pre-eruptive stage than at any other, and seeing that it was on the strength of the rash that they were certified and sent in, that was the strongest argument in favour of early infectivity and its early disappearance.

Dr. MEREDITH RICHARDS said that, in regard to the difference in the age incidence, Dr. Corbin based his figures on cases admitted and Dr. Goodall on cases observed. Probably a large proportion of Dr. Goodall's cases contracted the disease in hospital; if so, the age incidence of those cases would be governed by the age incidence of the scarlet fever and diphtheria patients from whom they occurred. He could not understand the good luck of the London Fever Hospital in not having cross-infection in their common measles ward. One would have expected a small amount of German measles, because it was the general experience that if rubella was introduced into a scarlet fever or diphtheria ward it did not tend to spread to any great extent. Dr. Goodall referred to the great difficulty in preventing the spread of ordinary measles, and Dr. Richards asked whether, since he had been on the look out for Koplik's spots, he had not had to modify his opinion on that point. Fortunately, for some years past, they at his hospital had been fortunate in limiting the spread of measles, and if one was on the look out for a second crop, it could be limited to that second crop, because one could isolate measles cases three or four days before the rash appeared.

Dr. F. N. HUME said the difficulty of diagnosis had come under his notice to a larger extent in relation to scarlet fever than to measles. During the last year a large number of cases had been sent into his hospital with a diagnosis of scarlet fever, though they were cases of r  theln. For various reasons, including the difficulty of isolation, he had sent many of them home again. In that case it was essential to have adequate grounds for forming that opinion. The opinion, in most of those cases, was formed on the character of the rash, it being, in his opinion, pinker than the scarlet fever rash. Thus it was a matter of opinion and eyesight. The second point was the position of the rash. Dr. Goodall mentioned that the rash of rubella went up to the mouth, and that ought to be emphasised very strongly, as it was of such great importance. In many cases the diagnosis between rubella and scarlet fever could be aided, if not established, by the fact that the rash of the one was present on the face, with entire indifference to the neighbourhood of the mouth, whereas scarlet fever was invariably absent from that region. The rash extended, in many cases, on to the surface of the palm and the sole, and that was important as distinguishing r  theln from scarlet fever. The difficulty in diagnosis was enormously increased when the case was not seen until the second day. Then there was a general erythema, which might be more or less punctate, and it was very difficult to be certain that it was not a case of scarlet fever. He had seen many cases in which the general distribution of the rash on the face, round the mouth, had been of great assistance. He agreed that the prodromal symptoms were unimportant and generally absent in the cases which occurred in hospital, and he had seen many such in the last twenty-five years. But in certain cases they were not to be despised. He had had the disease twice, and the second time severely. On a certain Saturday a medical man was examining him for life assurance, and said there was something wrong with him, though he was himself unconscious of anything of the kind. He submitted himself to two

other examiners, who said he had some temporary cardiac irritability. He was referred by the insurance company for a month. On the Saturday and Monday he had a considerable rise of temperature, and suspected that he might possibly have typhus, of which disease he had been seeing a number of cases. On Tuesday and Wednesday he felt comparatively well, but on Thursday, when he got up, he was covered from head to foot with a rash, which was considered to be r  theln. The incubation period was thus very clearly established. A patient, exactly a fortnight before he (Dr. Hume) was rejected, had been brought to the hospital as a case of small-pox, and was taken in for observation for twenty-four hours. He was a German, and he (Dr. Hume) was brought into communication with him, and there was no doubt that that patient was the author of his own illness.

Dr. BUTLER said his experience was that there was but little difficulty in diagnosing scarlet fever from German measles, and none in distinguishing between measles and r  theln. Some years ago, however, he had been greatly troubled with an outbreak of r  theln in the scarlet fever wards. Successive cases were sent in incubating the disease. There were other cases which came in with the wrong diagnosis—sent in as scarlet fever—whereas they were really cases of r  theln. But the frequent occurrence of cases incubating the disease indicated what he had since confirmed, that there were times when r  theln was very widely prevalent. There must be a fairly widespread prevalence of r  theln to bring repeated cases within one's ken at the same time. The superficial resemblance to scarlet fever was in most cases set aside by the distribution of the eruption. He had long regarded as almost pathognomonic the fact that r  theln invaded the circumoral region, and was present up to the lips; he had never seen scarlet fever with anything like that distribution. Whenever cases came in incubating it, he found that it was not easy to prevent the spread of r  theln thus introduced. So great was the difficulty that it became his practice to place all his contacts likely to incubate the disease in a separate ward, and he was struck by the extreme definiteness of the incubatory period, namely, eighteen days. He believed the absence of prodromal symptoms was not only constant, but was very valuable from the point of view of the medical officer of health. For several years he had been in the habit of differentiating, on somewhat meagre evidence, between outbreaks of r  theln and of measles in his district. Measles was notified by the teachers as soon as they were informed that a scholar was absent from a public elementary school on that account; and he had found there was a constant history of the onset of the illness. In the absence of any history of prodromal symptoms, he had been in the habit of saying he suspected that it was German measles, and, where medical men were called in, that was the diagnosis in the greater number. It was a crude way of arriving at it, but the fact that there were epidemics in which no prodromal stage was noticed, and that the cases generally proved to be German measles, threw an important practical light on the value of that fact.

Dr. CLAUDE B. KER (Edinburgh) said that in taking in measles many cases of German measles were seen amongst adults. His age periods more

closely corresponded with Dr. Corbin's than Dr. Goodall's. Considering the large number who appeared to come in by accident, it was astonishing how few young children came under that description. Two-thirds of his patients at the Edinburgh City Hospital were aged over 10. He desired to raise the question of prodromal symptoms. He had gone elaborately into the histories given by those old enough to do so, and found that many had suffered before the appearance of the rash, some of them many days before the appearance of any exanthem. One hundred and one cases out of 200 which he had seen had distinct symptoms twenty-four hours before the rash appeared; 18 cases over two days before; 21 cases three days before; 7 cases four days; and 8 cases from five to seven days before the rash occurred. These were adults, nearly all of them educated, such as students who came with German measles, chiefly because it was inconvenient to keep them at home. The absence of children among the subjects might be largely accounted for by the fact that the condition was regarded as trivial. The symptoms complained of were: Catarrh, coryza, &c., in half the cases; headache in one-third of the cases; sore throat in a quarter; definite stiff neck, which he had always been particularly on the look out for, in a quarter of the cases; malaise, nausea, &c., in a certain number; and vomiting in only 7 out of 101. With regard to the mucous membrane of the mouth, he always had the idea that a patient with German measles had a comparatively clean mouth. One could not always count on getting Koplik's spots in measles. But he believed very much in Koplik's spots. It was in the mild cases of measles, which were on the border-line between measles and German measles (which gave him more trouble than the diagnosis between German measles and scarlet fever), that the condition of the mucous membrane was of the most assistance. He had tried to see if the diazo reaction, which was so constant in measles, was uniformly absent in German measles, but he had had a disappointment, as he came upon two cases of German measles which gave just enough suggestion of it to destroy the idea. He thought the presence of that reaction was a strong point in favour of a case being measles.

Dr. J. T. C. NASH: I regret that the exigencies of time compelled me to leave before the discussion opened on Dr. Goodall's and Dr. Corbin's paper, and that I have to write this contribution under the disadvantage of not knowing what has already been said, but it is extremely likely that I shall not have been forestalled in the remarks I have to offer. The excellent papers which opened the discussion have made it clear that at times series of cases occur with a symptom syndrome sufficiently distinctive to justify the naming of a distinct entity or disease. All of us who have had to deal with fever hospitals can no doubt recall cases which we had no difficulty in diagnosing as typical rubella. But Dr. Goodall talks of "the natural duplicity of the disease itself," and "will not say that I have not at times made a mistake and applied . . . the wrong name." Dr. Corbin quotes the details of concurrent epidemics of rubella and morbilli at Haileybury College. "In only two cases was there any doubt between the diagnosis of rubella from measles." But there were those two cases. Neither Dr. Goodall nor Dr. Corbin bring forward any facts which in

any way influence me to change the views I expressed in a paper on "Evolution in Relation to Disease,"¹ which I had the honour of reading before the Epidemiological Society in March, 1906. I said at that time: "I am personally inclined to be of opinion that scarlet fever, diphtheria, rubella, &c., in typical instances are specialised types of disease resulting from evolutionary factors which have for a sufficient length of time been gradually influencing in various directions (fairly defined for each special type) the life processes of some, perhaps common, ancestral organism. As long as the evolutionary factors proceed on certain fairly definite lines, the tendency is for a recognisable variety of affection to be met with: and in this way a highly specialised variety of germ is evolved, and naturally tends to breed pure, at any rate for a considerable time. The *specialised* form will produce *special* toxins, which will give rise to *special* reactive phenomena which we forthwith recognise as specific disease. Under these circumstances, then, we see *typical* cases of scarlet fever, &c., and diagnosis is supremely simple. Should, however, the root of evolution be disturbed, and the specialised germ become subjected to unusual perturbation for a sufficient time, we shall have differences in the toxins formed, and a corresponding difference in the reactive phenomena giving rise to atypical, anomalous, or aberrant forms of disease. . . . I merely suggest . . . that if the Jonah of unalterable specificity is thrown overboard, such atypical forms of disease become at once explicable when our ideas are founded on the broad bases of evolution as applicable to infective diseases and their causal microphytes."² In addition to the illustrations I gave in the paper above referred to, I may mention two more recent ones of considerable interest. Although, at first sight, they may appear to have nothing directly to do with the clinical entity known as "rubella," they affect the question of evolution in relation to disease, which in my view bears directly on all infectious diseases. The first illustration has occurred quite recently in my own experience as follows: In October I was asked by a medical colleague to see a little boy at the Southend Victoria Hospital who had been admitted with severe scalds four days previously. He had the usual symptoms of scarlet fever, including a sore throat and strawberry tongue. There was no history of scarlet fever contact, but it was conceivable that, somehow, germs on the body had found entrance through the extensively damaged skin. He was removed to the fever hospital, and peeled profusely. No other patient in the Victoria Hospital ward developed scarlet fever, but the attending nurse had a sore throat a few days later. Further cases of sore throat occurred among the staff, and a suspicion of a diphtheritic infection arose in the mind of the attending physician, who submitted swabs for examination, but no Klebs-Löffler bacilli were found in any throat. The last case of all desquamated, upon which I was asked to investigate the matter. The second illustration I would refer to is the interesting record of an outbreak of sore throat in a large girls' school in Dublin last autumn, so ably

¹ *Trans. Epidem. Soc.*, 1906, xxv. N.S., p. 204.

² *Ibid.*, p. 228.

reported and discussed by Sir John Moore under the title of "Diphtheritic Fever."¹ For the details reference should be made to the original paper, but Sir John Moore thus summarises the symptoms which make up the clinical syndrome of diphtheritic fever. They are: (1) a more or less severe coryza; (2) a moderate tonsillitis, usually one-sided, and unattended by high fever or by much exudation; (3) thickly coated tongue and foul breath, the tongue desquamating as in scarlatina; (4) a patchy or punctate rash on the roof of the mouth and buccal mucous membrane; (5) swelling of the cervical lymphatic glands; (6) a roseolar rash on the skin (in 12 out of 18 cases; in 4 cases early; in 8 cases on the fifth to the seventh day from the first symptoms); (7) distinct desquamation (in 3 cases). The organism common to the throats of these Dublin cases was a diphtheroid bacillus, probably a specialised form of the diphtheria bacillus, which after a time tended to revert to the true diphtheria bacillus, giving rise to two cases of diphtheria in the country when the girls broke up for the Christmas holidays, about two months after their illness. This interesting record strengthens the position I have taken up² with regard to a subtle connection between two diseases so distinctly differentiated in typical instances, as scarlet fever and diphtheria. Rubella is, in my opinion, a less common disease than measles or scarlet fever only *because it is a less specialised disease*. The "fourth disease" of Dr. Dukes is even more unstable. But for the enlightenment which follows on a clear realisation of the possibilities of evolution in relation to disease one might have attempted ere now to record rare instances of even a "fifth" or a "sixth" disease. In my humble opinion rubella is certainly a sufficiently stable entity under *certain conditions* to justify its symptom syndrome, earning for it a distinctive name; but I repeat my conviction it is due to a less highly specialised germ than in either scarlet fever or diphtheria or measles. Further, I think the evidence so far available points to a common ancestral origin for the special germs, responsible, on the one hand for measles, and on the other for rubella.

Dr. GOODALL, in reply, said he thought the different age incidence in the two papers was due to the different class of patients admitted to the two hospitals. It would be interesting to know what were the ages of the patients with scarlet fever at the London Fever Hospital. He thought they were of higher ages than those in the Metropolitan Asylums Board hospitals. After two years at the London Fever Hospital he would have said that rubella occurred chiefly among young adults. About half his own cases were contracted in hospital. Some were admitted under the guise of scarlet fever. Seventy-five per cent. of the cases had been children aged under 10. To get a true idea of the incidence of rubella it was necessary to combine the statistics of Dr. Corbin and Dr. Ker with his own. It was difficult to find records, as men treated the affection as so trivial that they did not trouble to record it. He thought it was fairly frequent, but not so much so as measles or scarlet fever. Last year

¹ *Dublin Journ. of Med. Science*, 1908, cxxv., p. 10.

² *Brit. Med. Journ.*, 1902, i., p. 56. *Trans. Epidem. Soc.*, 1906, xxv. N.S., p. 205.

it was very prevalent; every hospital under the Asylums Board had cases of it, and he had heard of it also in other parts of the country. He agreed with what had been said about the prodromal symptoms, but this was not a Clinical Section. Sometimes the peeling was remarkable. With regard to Dr. Richards's remarks about early isolation, he had in mind several cases which were left for hours in the ward. If measles was detected in the first few hours there might be no more cases, but if left longer than that there might be secondary cases: and that went on gradually until perhaps the ward was not out of quarantine for three months. Nearly all his patients had been children, and one could say that the rash was nearly always the first symptom. At the London Fever Hospital he saw cases with a longer prodromal period. He remembered Dr. Hopwood diagnosing a case as having German measles several days before the rash; the patient had enlarged glands and a temperature. The diazo reaction he had not tried. When he was at the London Fever Hospital twenty years ago he saw many cases, and found the diazo reaction in some cases of German measles.

Dr. CORBIN, in reply, said he thought the different age incidence was due to the fact that children were not admitted to the London Fever Hospital suffering from German measles because it was regarded as a trivial affection. The cases admitted were turned out of business houses, schools, and hotels, probably out of regard for other people's feelings. It was true that the age incidence of scarlet fever in that institution was higher than in the cases admitted to the Metropolitan Asylums Board hospitals. But more children were admitted to the London Fever Hospital with scarlet fever than with German measles, because people regarded the disease as more serious. Much as he liked clinical medicine, he had not ventured to touch on that aspect in his paper. He would have liked to draw attention to symptoms which he had noticed in connection with certain cases at the London Fever Hospital, but he had left that out in obedience to a desire to make the paper as short as he could. He agreed with Dr. Caiger's remark about adenitis in German measles. If the postauricular, mastoid, and occipital glands were enlarged and tender, he thought that was the sign as near to being pathognomonic as any could well be in rubella. Five per cent. of his cases of rubella had not any adenitis, and 18 per cent. were confluent, the rash starting as discrete rose-coloured papules, which became confluent rapidly, so that if those cases had not been seen in the early stage, it would not have been possible to say whether the condition was scarlet fever or not. He agreed with Dr. Ker as to there being a longer prodromal period in some cases, the patients complaining, without any leading questions, of enlarged and tender glands in several situations. Faucial catarrh was common in rubella, and a condition which no one had referred to and which was not usually recorded was a granular condition of the soft palate in German measles, which was not seen in scarlet fever or ordinary measles. When he said that German measles and measles were admitted to the same ward, he knew that was throwing a bomb into the meeting. He was not responsible for it; it had been going on for twenty years, and successfully.

With regard to the reasons why more trouble had not arisen owing to cross infection, he did not lay great stress on it, but he thought rubella was infectious in the prodromal period almost entirely, and not at any subsequent stage. All cases at the London Fever Hospital were kept in bed until the faucial catarrh and rash had disappeared. It would probably be risky in a children's hospital to carry out such a régime, but he thought infections might be divided into long and short, depending on the striking distance. Chicken-pox and small-pox were long-distance infections, and one could scarcely remove such cases soon enough; but German measles would not infect except by actual contact. Among nurses, only those who were great friends of the attacked nurse got the disease from her, the incubation period being in each case seventeen days. With regard to Dr. Hume's and Dr. Butler's remarks, he had seen several cases admitted into scarlet fever wards in which the scarlet fever rash had invaded the circumoral region, and he had a case now in which there was a definite rash round the mouth, and in which desquamation was now occurring in the circumoral region. It was not that a mere flush had been present there.

Epidemiological Section.

February 28, 1908.

Dr. NEWSHOLME, President of the Section, in the Chair.

Mendelism in Relation to Disease.

By R. C. PUNNETT, M.A.

It was with some trepidation that I accepted an invitation to read a paper bearing upon the inheritance of disease before a distinguished body like the Royal Society of Medicine; but I recollected the motto cut upon the wall of the medical schools at Cambridge—*ἄριστος ἰατρός και φιλοσοφός*—and I ventured to hope that, even if the remarks which I have to offer to-night might fail to excite the interest of the physician, they would, at any rate, claim the indulgence of the philosopher.

Since the rediscovery of Mendel's paper a few years ago, the experimental study of heredity has made rapid progress, and the recent work has served to confirm and extend the principles which he laid down. What these principles are may be most readily gathered from the consideration of a concrete example, and as a simple illustration we may take a well-known case among poultry, that of the Blue Andalusian fowl. It is a bird which has long been known to possess an inconvenient peculiarity: it will not breed true. It always throws "wasters" of two sorts: blacks, and whites marked with some black splashes. There are, therefore, three kinds of Andalusians, and consequently six possible types of mating among these three varieties. With regard to the results of these types of mating, careful experiment has brought out the following facts:—

Blue	×	Blue	gives	Blacks, Blues, and Whites, in the ratio 1 : 2 : 1.
Blue	×	Black	„	Blacks and Blues in equal numbers.
Blue	×	White	„	Blues and Whites in equal numbers.
Black	×	Black	„	Blacks only.
White	×	White	„	Whites only.
Black	×	White	„	Blues only.

We are dealing here with a case in which every possible form of mating has been carried out, and some of the results at first sight seem paradoxical. Thus, for instance, the blacks always breed true whatever their ancestry may have been; and the same holds good for the whites. The white that is produced by two blues, themselves the product of mating blue with blue over many generations, breeds as true to whiteness as the white of pure white ancestry. A black is pure for blackness and a white is pure for whiteness whatever the ancestry of the bird may have been. Again, it seems at first sight incongruous that the mating of black with white should give just twice as many blues as two blues mated together.

The theory of heredity first propounded by Gregor Mendel enables us to summarise all these results in a very simple and beautiful way. Briefly it is as follows. We are dealing with an alternative pair of characters, blackness and whiteness. Every germ-cell or gamete, whether ovum or spermatozoön, bears a representative of this pair. But it can bear only one representative, viz., *either* blackness *or* whiteness. Hence for this pair of characters there are two, and only two, types of gamete: "black" gametes and "white" gametes. When a black gamete meets a black the result is a black bird; when a white meets a white the result is a white bird. But when a white meets a black the resulting zygote contains the representatives or factors for both blackness and whiteness, and develops into a blue bird. Now we must suppose that the gametic representative of a character, the factor, is an unsplitable entity so far as inheritance is concerned. The zygote being formed by two gametes must contain two factors. It is a double structure, and when it comes to form gametes these single structures are produced by the separation of the two factors present in any zygotic cell. The factors representing the characters are said to *segregate* from one another in the process. In a zygote produced by the union of similar gametes, the segregation is between like factors, and all the gametes produced are alike. But a zygote which has been formed by two dissimilar gametes, each bearing one of the factors corresponding to a pair of characters, must on forming gametes give rise to gametes of two sorts, and must give rise to them in equal numbers. On this simple hypothesis is afforded a ready explanation of the various experimental facts given above. A blue hen is producing equal numbers of "black" and "white" eggs—let us say $2n$ of each. To fertilise these eggs are brought large numbers of spermatozoa of the two sorts, black and white, in equal numbers. Every black egg, then,

has an equal chance of being fertilised by a black or a white spermatozoön. In the former case it will form a black and in the latter a blue bird. From our $2n$ black eggs we shall obtain n black and n blue birds. Similarly from our $2n$ white eggs we shall get n blue and n white birds. That is to say, the mating of blue with blue must, on the assumption of the purity of the gametes, give black, blue, and white birds in the ratio 1 : 2 : 1.

Let us now put in a more general form what we have learned from this and similar cases. The characters of plants and animals may in many cases be regarded as existing in alternative pairs. Corresponding to each member of such a pair is something representing it which may

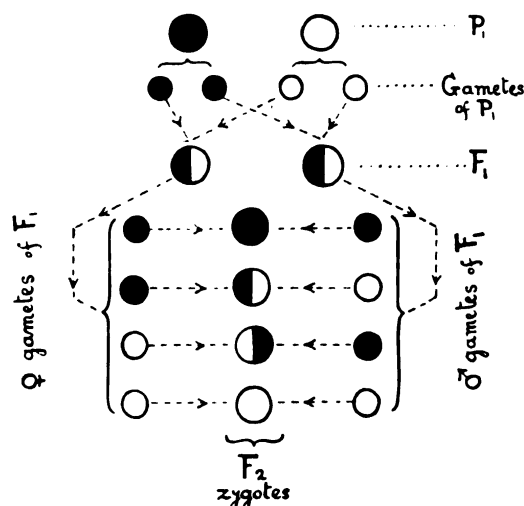


FIG. 1.

Scheme to illustrate inheritance in a simple Mendelian case, such as that of the Andalusian fowl. Gametes from each of the pure parents, the black and the splashed white, meet to form the heterozygous blues. When these come to form gametes the elements representing blackness and whiteness in the germ-cells segregate from one another, so that equal numbers of black and of white gametes are formed. The scheme further illustrates how, from a male and female series of such gametes, the resulting generation comes to consist of two homozygous individuals (one for each character of the pair) and two heterozygotes.

be carried by the gamete. These factors which the gamete carries are the channel by which the qualities of the parent are transmitted to the offspring. Every gamete contains one, and only one, of the factors corresponding to a given pair of characters, *i.e.*, is pure for that character. For any given pair of characters, therefore, there can be

two, and only two, classes of gametes: those pure for one member of the pair and those pure for the other member of the pair. But there can be three different kinds of zygote, for each zygote is formed by the union of two gametes; and since two kinds of gamete exist it is obvious that three kinds of union among them are possible. Two gametes, each pure for one member of the alternative pair of characters, may unite; or two gametes, each pure for the other member of the pair, may unite; or thirdly, two unlike gametes may unite. The zygote so formed contains representatives of each member of the pair and is known as a *heterozygote* (hybrid), whereas zygotes containing representatives of but one member of the pair are termed *homozygotes*. Like the homozygotes, the heterozygote produces pure gametes; only it produces equal numbers of the two kinds instead of producing all of one kind. In this lies the explanation of the fact that hybrids mated together produce a definite proportion of the pure forms, which subsequently breed true without ever giving a hint of their mixed ancestry.

DOMINANT AND RECESSIVE.

In the simplest cases, such as those of the Andalusian fowl, we are dealing with but a single pair of characters, in so far as the gametes are concerned, and we are able to distinguish in appearance the birds arising from the three forms of zygote that these gametes can form. But in a large number of cases it is not possible to distinguish the hybrid from one of the parents. Rosecomb bantams exist in two forms, white and black. Each form breeds true, but when the two are crossed the hybrids all resemble the black parent. The zygote which contains a single dose of blackness grows up into a bird which is as black as the pure black containing a double dose of blackness—a point of difference to the Andalusian, where the zygote with only a single dose of blackness develops into the more or less intermediate blue. In cases such as this of the rosecombs we use Mendel's terms, and speak of the character blackness as *dominant* to whiteness, which is said to be *recessive*. When the hybrids (F_1) are mated together they give, as we have already seen in the case of the Andalusians, one of each of the two homozygous forms for every two heterozygotes. But since black is dominant to white the heterozygotes are indistinguishable in appearance from the dominant homozygote, and this, the F_2 generation, consists visibly of three blacks to every white. The whites subsequently breed true, as do also the

homozygous blacks when they are mated together. But if we wish to separate these homozygous blacks from the heterozygous we must devise some test. And the only test we know of at present is the test of breeding. All the gametes of a homozygous black contain the factor for blackness. Consequently, when such a bird is mated with a white all the offspring must be black. But a heterozygous black is giving off equal numbers of "black" and "white" gametes. Hence, when mated with a white it will form equal numbers of zygotes with and without a black factor, *i.e.*, it will produce equal numbers of black and white birds. The test between the pure dominant and the dominant which carries the recessive character lies in crossing each with the recessive. The former produces only dominants, while the latter gives rise to equal numbers of dominants and of recessives. But whether the phenomenon

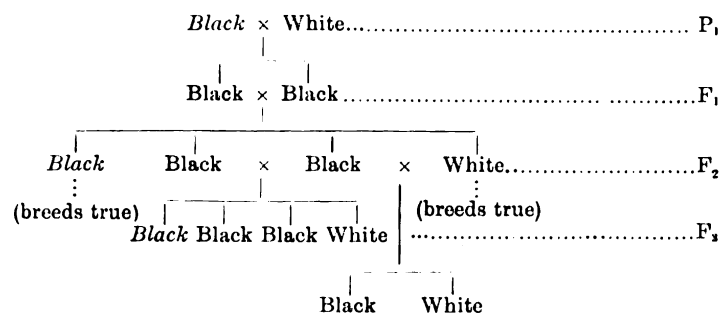


FIG. 2.

Scheme illustrating inheritance in rosecomb bantams. Homozygous blacks in italics to distinguish from heterozygous. P₁ signifies parental generation, F₁ first filial generation, F₂ second filial generation, and so on.

of dominance is present or not, the essential feature of Mendel's discovery is unaffected, and this, of course, consists in the conception of the characters of living things as existing in alternative pairs, and of the purity of the gamete for either member of such a pair.

DIVERSITY OF CHARACTERS SHOWING MENDELIAN INHERITANCE.

Mendel's principles have now been confirmed in many plants and animals, and for many different characters. A few illustrations will serve to give some idea of the diversity of the characters for which these principles have already been shown to hold good. For the sake of convenience they have been arranged under several headings.

Size.—In peas, sweet peas, and many other plants there exist dwarf forms. In the cases hitherto worked out the tall has been shown to be dominant to the dwarf.

Structure.—In plants: the shape of the leaves and of the flowers in primulas, of the seed in *Pisum*, of the flowers and pollen grains in *Lathyrus*, the spines of *Datura*, the beard of wheat, &c. In animals: the long Angora hair of rabbits; in fowls the silky plumage, taillessness, shape of comb, crest, brain hernia, &c.; in mice, hairlessness and the waltzing habit.

Chemical.—Sugary and starchy endosperm in maize; glutenous and starchy endosperm in barley; colour and albinism in animals.

Time of Flowering.—Whether biennial or annual in *Hyoscyamus*.

Colour.—In most plants purple or blue is dominant to red; deeper colours are usually dominant to dilute ones. In animals: grey is dominant to black in rabbits, rats and mice; bay is dominant to chestnut in horses. Black is dominant to brown in the down colour of chickens. Colour differences readily lend themselves to experimental work, and they have been largely made use of in this connection.

Sterility of the anthers in the sweet pea is recessive to the fertile condition. In barley partial sterility is dominant to the completely fertile form.

Immunity to disease in wheat.

From the point of view of medicine the last is probably one of the most important experiments ever made. Mr. Biffen, in Cambridge, crossed a wheat immune to the attacks of yellow rust (*Puccinia glumarum*) with another wheat highly susceptible to such attacks. The hybrids were all severely attacked, and Mr. Biffen experienced some difficulty in saving from them sufficient seed to get a reasonably large crop in the following year. Having grown them on, he found that in this generation came rusted and rust-free plants. Though growing all among and brought into the closest contact with their diseased brethren these rust-free plants showed no sign of contamination. On counting the F_2 generation it was found that out of 2,132 plants, 523, approximately one-quarter, were immune; and such immune plants gave rise to immune offspring only. Susceptibility and resistance to disease in wheat are a pair of characters obeying the Mendelian law of inheritance, and consequently brought completely within the scope of human control.

HUMAN EXAMPLES.

And here I may bring forward certain simple cases which concern our own species. Such cases are difficult to come by, for the marriage system of the civilised nations is none too well adapted for the demonstration of Mendelian principles. We have, indeed, but one method, viz., the careful collection of pedigrees and the critical examination of them in the light of the knowledge gained more directly from other species. Among our scanty data a few cases stand out clearly. During the past year Mr. Hurst¹ was able to demonstrate a Mendelian pair of characters in eye colour. Brown pigmentation on the front of the iris is a character dominant to the condition of the iris—whether grey, blue, or violet—in which such brown pigment is absent.

But perhaps the most conspicuous example of Mendelian heredity in man is the case of brachydactyly worked out by Farabee² in America, and more recently by Drinkwater³ in England. This peculiar condition of the hands and feet, which is at the same time associated with shortness of stature, was found by both these authors to be dominant to the normal form. In fig. 3 I have reproduced from his paper the pedigree of Drinkwater's family. In this, as well as in the other human pedigrees with which we shall have to deal, it is always assumed, unless expressly stated to the contrary, that the diseased individual is always mated to a normal. Consequently, in the pedigree, every brachydactylous individual must be regarded as heterozygous and must produce abnormal and normal gametes in equal numbers. Such an individual married to a normal should therefore produce equal numbers of normal and abnormal offspring, just as the heterozygous bantam, mated with a white, produced equal numbers of blacks and whites. Drinkwater found that all the families from abnormal parents together consisted of thirty-nine abnormal and thirty-six normals—a close approximation to the equality which we should expect on Mendelian principles. On these principles, again, we should expect all the normals, being recessive, to breed true, and to give no abnormal when mated with a normal. An inspection of the pedigree shows that this condition is also fulfilled. The evidence, taken with that collected by Farabee, is sufficient to put it beyond all reasonable doubt that we are dealing with a simple Mendelian case, and we may state with confidence that no member of a brachydactylous family who is free from the disease can transmit it to his or her

¹ *Proc. Roy. Soc.*, 1908, Series B., lxxx., p. 85.

² "Papers of Peabody," *Mus. of Am. Arch. and Ethnol.*, Harvard Univ., 1905.

³ *Proc. Roy. Soc. Edin.*, 1908, xxviii., p. 35.

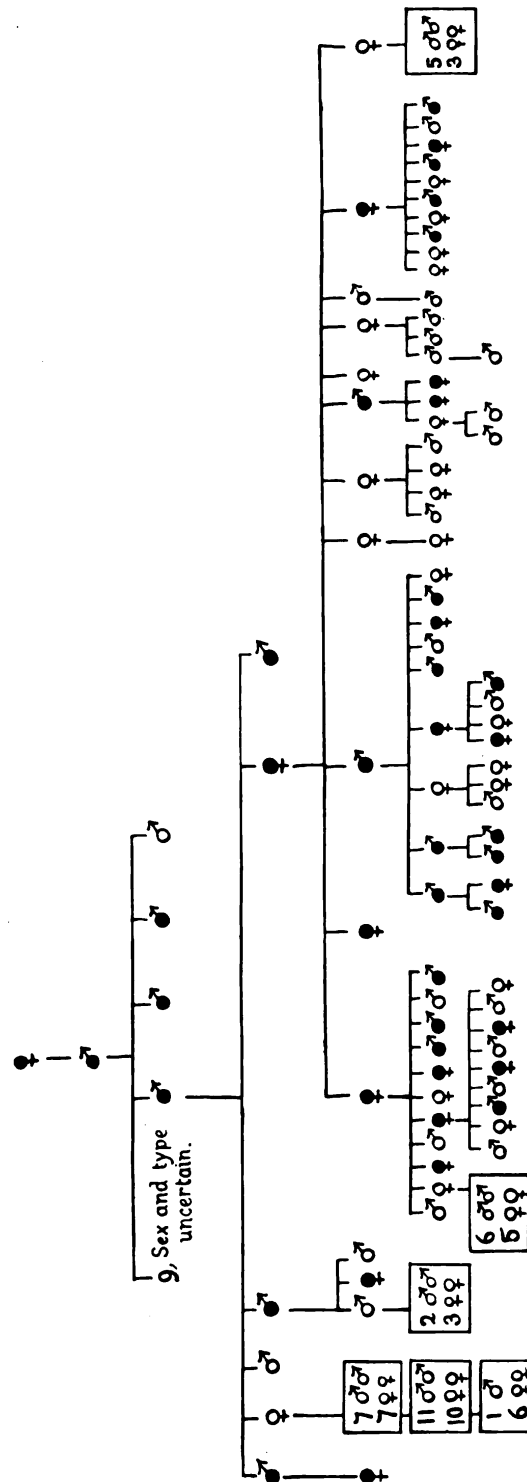


FIG. 3.

Pedigree of a brachydactylous family (from Drinkwater). The affected individuals are shown in black. A few children for whom there was no record as to the brachydactylous condition have been omitted.

offspring; but it can and must be transmitted by the brachydactylous members only.

For one of the most remarkable pedigrees that has ever been got together we are indebted to Mr. Nettleship.¹ It concerns night-blindness, a condition apparently due to loss of the visual purple, and deals with the descendants of one Jean Nougaret, who was born in the year 1637. The pedigree has been brought down to 1907. It extends over ten generations and includes records of more than 2,000 individuals. The diseased condition evidently behaves as a simple dominant over the

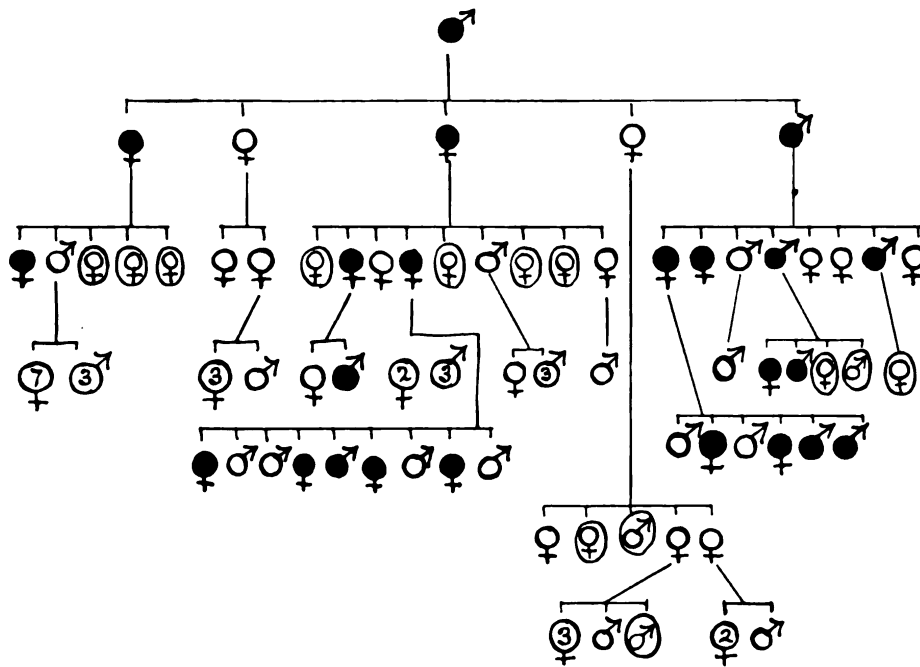


FIG. 4.

Pedigree illustrating the inheritance of diabetes insipidus (polyuria) (after Weil).

normal. During two and a half centuries no normal member of the family who has married another normal, whether a member of the family or not, has ever transmitted the disease. On the other hand, the affected members, who have in almost all cases married normal persons, have transmitted the diseased condition to many of their offspring. The number of diseased is actually somewhat less than half, but, as Mr. Nettleship points out, there is a marked inclination to conceal the disease, which in some cases doubtless has been attended with success. By the

¹ *Ophthalm. Soc. Trans.*, 1907, xxvii., p. 269.

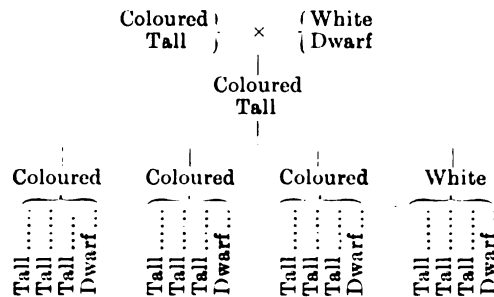
side of a history such as this the other pedigrees which I am able to show you must seem comparatively insignificant. Mr. Bateson has recently been collecting together evidence from various sources on certain forms of hereditary disease. In some of these cases, notably those of keratosis palmæ and congenital cataract, the evidence points to the diseased condition behaving as a simple Mendelian dominant to the normal; and it seems not improbable that other cases, such as diabetes insipidus (fig. 4), irideremia, ectopia lentis, hereditary chorea, and epidermolysis bullosa, may eventually turn out to fall within the same category. In some of them there are records of the disease being transmitted by normals, but whether this is due to mistaken observation or whether it indicates some more complicated scheme of inheritance must be left for future investigation to decide.

So far we have considered only the simplest of cases, involving but a single pair of alternative characters. Nevertheless, we have already been able to analyse successfully cases in which two or more pairs of characters play a part. Though no human examples of this nature are at present known to us with any degree of certainty, there is little doubt but that conditions similar to those I am about to describe will eventually have to be investigated for our own species; and a proper understanding of the principles based upon the hereditary behaviour of the colour of the rabbit and of the sweet pea may well serve in the future to illuminate some of the obscurer phenomena of disease in man.

DIHYBRIDISM.

Dihybridism is the term applied to cases in which the parents crossed differ from one another in two pairs of alternative characters. It was found by Mendel that in such cases the inheritance of each pair follows the same rule, but follows it independently. Tallness in the pea is dominant to dwarfness, and colour in the flowers is dominant to white. When, therefore, a tall coloured is crossed with a dwarf white all the offspring are tall plants with coloured flowers. In the next generation talls and dwarfs appear in the ratio 3 : 1, and coloureds and whites also appear in the ratio 3 : 1. Hence each tall plant has three times as many chances of being coloured as of being white. Similarly the dwarf coloureds must be three times as numerous as the dwarf whites. A moment's consideration will serve to show that the simplest expression which covers all these requirements is nine tall coloured, three tall

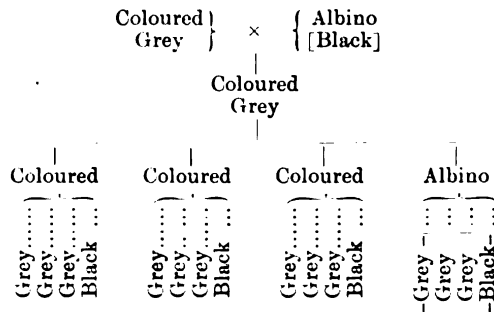
whites, three dwarf coloured, and one dwarf white. And these are the proportions actually found by experiment in this and other cases. This is the 9 : 3 : 3 : 1 ratio characteristic of cases of simple dihybridism, and we may state it in a more general form as follows: When two individuals are crossed which differ in two pairs of alternative characters, the F_2 generation consists of four classes, and, out of every sixteen, nine on the average exhibit both dominants, three one of the dominants and one of the recessives, three the other of the dominants and the other of the recessives, and one exhibits both recessives. The simple and orderly distribution of the characters to form this ratio may be taken as proof that each pair of characters, though obeying the same hereditary law, obeys it independently of the other.



INTERDEPENDENCE OF CHARACTERS.

The distribution of two pairs of characters is not always so simple in appearance as in the case of the peas. The characters belonging to different pairs sometimes interact upon one another, and the way in which this comes about may best be explained by an example. A grey Belgian hare rabbit was crossed with an albino Angora. The progeny were all of the wild grey type. They were in-bred and produced in the next generation greys, blacks and albinos, the proportional numbers of the three kinds being 9 : 3 : 4. The proportion of coloured rabbits to albinos is 3 : 1, suggesting at once that colour and albinism are a pair of alternative characters, of which the former is dominant; and among the coloured the ratio of greys to blacks (9 : 3 = 3 : 1) points to greyness and blackness forming another pair of characters. If such is the case we ought to find among our sixteen rabbits twelve greys and four blacks. That we only find nine greys and three blacks is because one-quarter of our sixteen rabbits must be albinos, lacking the colour factor which enables the particular colour present, whether grey or black, to declare

itself. There must therefore be both grey albinos and black albinos, and this may be tested by mating an albino with a pure black. Since colour is dominant all the offspring will be coloured, but those albinos which carry the factor for greyiness will give greys and those without this factor will give only blacks; and experiment has shown that this is the case. Albino rabbits may be compared to exposed but undeveloped negatives. The silver has undergone a change, but what the image is we cannot say until the developer is poured upon it. So with albino rabbits. By crossing with a black containing the factor which allows the colour to appear, we are, as it were, pouring on the developer, and the resultant colour, whether grey or black, tells us what manner of albino we had to deal with.



THE NATURE OF THE ALTERNATIVE PAIR.

At this stage we may ask ourselves a question: What is the nature of these pairs of alternative characters? What is the relation subsisting between the two members of a pair? It is a remarkable fact that we should be able to express all the diverse qualities with which we have been dealing in terms of alternative pairs. Why do we never find longer series of characters—three, four, or even more—which can replace one another as alternatives in the gamete? As the explanation upon which I am about to enter may seem to verge upon the metaphysical, it will be as well to commence it with a concrete illustration. In fowls the rose comb is dominant to the single comb, and these two form an alternative pair. Now, the view of the nature of the rose comb that I wish to suggest to you is that it is a single comb, to which an additional element “roseness” has been added. Singleness underlies roseness, and if our methods were sufficiently delicate to remove this element of roseness from a rose comb we should be left with a single

comb. A rose comb is a single in which an additional element of roseness is present; a single comb is a single because this additional element is absent. And herein lies the explanation of the curious circumstance that the characters of animals and plants can be expressed in terms of

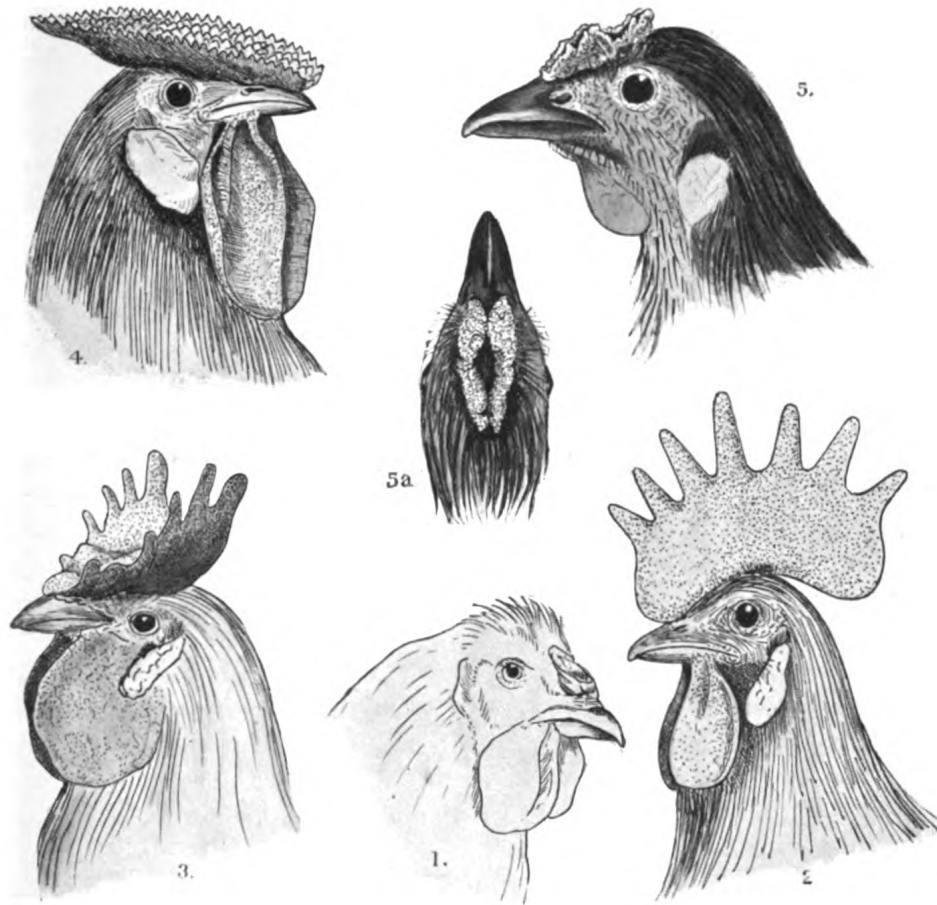


FIG. 5.

To illustrate various forms of comb connected with the Breda \times Rose experiments. 1, Breda; 2, Single; 3, Breda \times Single; 4, Rose; 5 and 5a, Breda \times Rose. From two of these last mated together Singles appeared in F_2 .

alternative pairs. Such pairs represent the only two relations which the unsplitable factor representing a given character can have with the gamete. It can either be present or it can be absent, and no third

relation is possible. When this view suggested itself to us we at once set to work to devise an experimental test of its validity. We argued that if we could find a fowl with some form of comb recessive to single, and crossed such a bird with a rose-combed bird, we ought to get single-combed birds in F_2 . We were fortunate in finding the breed for which we were looking in the Breda fowl, a bird in which the comb is practically non-existent. When crossed with a single these birds produced chickens with large double combs. The combs are duplex because the Breda carries an element of "duplicity" which is dominant to the "simplicity" of the single comb. But the point with which we are immediately concerned is that the Breda cannot carry the factor that makes the single comb, for our crossing experiment has shown that if it did so it would no longer remain a Breda. Having, therefore, proved the absence of single in our Breda, we proceeded to cross it with a rose, and obtained birds with duplex rose combs. These F_1 birds mated together gave Breda combs, duplex and simplex roses, and duplex and simplex *singles*. Having already proved that the single cannot have been present in the Breda, it is obvious that it must have come from the parent rose, and we must consequently suppose that single underlies rose in the way that we have already suggested. The great majority of Mendelian cases fit in with what we call the "presence and absence" hypothesis, and in them we must regard the dominant as the additional and the recessive as the underlying character. All tall peas are dwarfs containing an additional "tall" factor; all purple sweet peas are reds to which a purpling factor has been added. There are, however, cases in which the presence of a quality in the zygote is recessive to its absence. Thus the bearded is recessive to the beardless condition in wheat, and in man the night-blind condition, with its probable absence of visual purple, is, as we have already seen, dominant to the normal. It may be that these cases will ultimately be brought into line by the discovery of inhibitory factors, but the evidence is not at present sufficient to render further discussion profitable.

I have laid some stress upon the presence and absence hypothesis of the relation between the factors of an alternative pair because it is of especial interest in connection with a human disease. The evidence recently collected by Dr. Garrod¹ on alkaptonuria points strongly to this condition being recessive to the normal. With very rare exceptions the alkaptonuric patient is the offspring of normal parents. Such normals

¹ *Lancet*, 1902, ii., p. 1616.

must be regarded as heterozygous dominants, and it is striking to find that the majority of cases involve first-cousin marriages, a condition obviously favourable for bringing heterozygous dominants together. If the diseased condition is recessive, the diseased should form one-quarter of the total number of members of the families in which they occur. Dr. Garrod gives figures for such families. Where the condition of all the offspring has been recorded there are fifty-one normals and sixteen alkaptonurics, a very close approach to the expected ratio of 3 : 1.

The chemistry of the alkaptonuric condition is well known,¹ and the disease depends upon the inability of the organism to bring about a specific reaction by which the benzene ring is broken down and homogentisic acid transformed into lower products. Is the failure of the organism to bring about this reaction due to the absence of a specific intracellular ferment? At present there is little evidence for or against this view, though the work of Czapek and others on homogentisic acid in plants is certainly suggestive. And the fact that the diseased condition is recessive to the normal points to there being something in the normal which is lacking in the diseased. If the chemist could isolate this hypothetical ferment it would serve to clear up our ideas upon the condition known as the diathesis to a disease, and would offer the hope of these conditions falling within the scope of heredity and consequently becoming amenable to human control.

INTERACTION OF CHARACTERS.

A beautiful example of the interaction of characters is afforded by the sweet pea. As in most flowers, white is here recessive to colour. All white sweet peas breed true, and in most cases a cross between two whites will result in white-flowered plants only, but when certain strains of whites are crossed together the offspring are all coloured. When a further generation is grown from these plants they produce coloureds and whites in the proportion 9 : 7. The case has now been fully worked out as far as heredity is concerned, and it is evident that we must regard colour as made up of two factors. Each of these factors may be present or absent in a sweet pea, in this way constituting two alternative pairs. We must suppose each of the parent whites of our cross to have been homozygous for the presence of one of these factors and for the absence of the other. If we denote our two factors by C and

¹ Cf. Leathes, J. B., "Problems in Animal Metabolism," 1906, p. 195.

R, then the gametes of one white all contained C and not R, while those of the other all contained R and not C. By crossing two such whites a zygote is formed which contains both C and R, the two factors necessary for the production of colour. The gametes of the F_1 plant segregate in the normal way, and as in ordinary cases of dihybridism they give rise to four classes of zygote in the proportion 9 : 3 : 3 : 1. But since only the zygotes containing both dominants can appear different to the rest by showing colour, the three last terms of the ratio, the 3 : 3 : 1 terms, are indistinguishable; hence the ratio 9 : 7. What the symbols C and R represent we do not know. It is tempting to suppose that one of them is a ferment and the other a fermentable substance. Mendelian analysis cannot do more than indicate the presence of these two specific substances. The task of isolation and identification falls within the province of the chemist. Interesting as the case of the sweet pea is from the theoretical side it has also a conceivably practical aspect. In an F_2 family with a 9 : 7 ratio the 7 group consists of five classes of individuals. There are five different kinds of white sweet peas, and in the various types of mating possible between them a cross between two whites may give any of the following results:—

(a) All coloured	...	...	...	...	[CCrr × ccRR] ¹
(b) Equal numbers of coloured and whites	...	...	...	...	[CCrr × ccRr]
(c) One-quarter coloured, three-quarters whites	...	...	...	...	[Cerr × ccRr]
(d) All whites	...	...	...	...	[Any white × ccrr]

¹ The letters in brackets give a form of mating which would produce the particular result. In most cases the same result may be obtained by several types of mating. For simplicity, however, only one is shown in each case.

And since there are also several kinds of coloured plants (indistinguishable in appearance), the cross between coloured and white may produce any of the following results:—

(a) All coloured	...	...	...	...	[CCRR × any white]
(b) Three coloured to one white	...	...	...	...	[CCRr × ccRr]
(c) Equal numbers coloured and white	...	...	...	...	[CCRr × CCrr]
(d) Three whites to one coloured	...	...	...	...	[CcRr × ccrr]

Lastly, two coloureds crossed together may give either:—

(a) All coloured	...	...	...	...	[CCRR × any coloured]
(b) Nine coloured to seven white	...	...	...	...	[CcRr × CcRr]
(c) Three coloured to one white	...	...	...	...	[CCRr × CCRr]

Now for “coloured” write “diseased,” and for “white” write “normal.” The number of possibilities is great. Diseased may produce

normals, and normals mated together may produce diseased. True, we know of no such case so far among men, but that is no reason why it should not exist, and it may be that some day the sweet pea will provide the clue to a human disease.

This case of the sweet pea may be paralleled among poultry. We have recently succeeded in finding two white breeds of fowls which breed true to whiteness, which each behave as recessive to colour, but which, on crossing, produce only coloured birds. Moreover, for the following reason, this case of the poultry is even more complicated, for there exist also white fowls whose whiteness is dominant to colour. There are therefore certainly three kinds of white fowls which breed true and may be indistinguishable in appearance, but owe their whiteness to entirely different causes. Fundamental chemical differences are doubtless involved, and the problem may one day be solved by the chemist. At present there is only one method of distinguishing and of separating these similar unlikes, and that is the method of Mendelian analysis.

GAMETIC COUPLING.

In the cases with which we have been dealing, the appearance of a given character depends upon the presence of two factors in the zygote. Yet these factors in heredity behave quite independently, each obeying the simple Mendelian rule. There are, however, cases in which we meet with a new phenomenon, in which there exists a tendency for factors to become definitely associated together or *coupled* in the gamete. Such coupling of distinct characters may be complete. In sweet peas purple is dominant to red, and the erect standard is dominant to the hooded standard; and in families in which purples and reds occur together with erect and hooded standards, the ratio of purples to reds is 3 : 1, and of erect to hooded standards is also 3 : 1. If this were a simple case of dihybridism, such as we have already dealt with in peas, we should expect the distribution of erect and hooded standards among the purples and reds to be governed by the laws of chance, and we should expect our generation to consist of the four classes: erect purple, hooded purple, erect red and hooded red in the normal ratio 9 : 3 : 3 : 1. This, however, is not the case. All the reds display the erect standard and the hoods are all to be found among the purples. Consequently, our family consists of hooded purples, erect purples, and erect reds in the ratio 1 : 2 : 1. We are driven to suppose that all the gametes which

carry hood carry purple also, and that only the red gametes carry the factor for erectness. In other words there is complete coupling in the gamete between purpleness and hood on the one hand, and between redness and erectness on the other. Since every red gamete must carry also the factor for erectness, it follows that in such families as these all the reds must be associated with, and breed true to, the erect character.

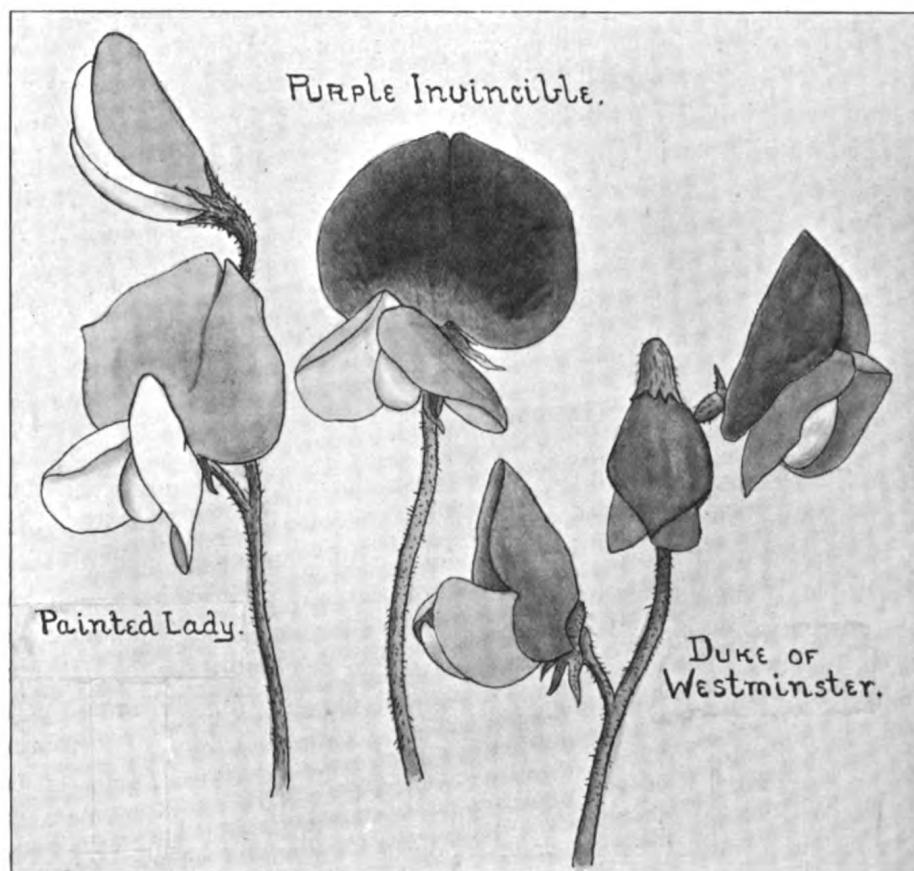


FIG. 6.

Showing three sweet peas: (a) red, with erect standard; (b) purple, with erect standard; and (c) purple, with hooded standard.

Nevertheless we know that hooded reds may occur in other strains. What the conditions are which determine whether hood and redness may or may not be found in the same gamete is a problem which we are experimentally attempting to solve.

PARTIAL COUPLING.

Coupling between characters is, however, not always complete. Among sweet peas there are two distinct varieties of pollen grains—elongated or “long,” and “round.” The long behaves as a simple dominant to the round. In families which contain purples and reds, and also long and round pollens, the ratio of purples to reds is 3 : 1, and the ratio of longs to rounds is also 3 : 1, but there is a marked tendency for long pollen to be associated with the purples and for round pollen to stick to the reds. The coupling is, however, not absolute. The long purples are about twelve times as numerous as the round purples, and this deficiency of rounds is compensated for among the reds, where they are more than three times as numerous as the longs. We must suppose that there is a coupling of purpleness with long and of red with round in most of the gametes, though not in all. If we imagine that out of every eight purple gametes seven carry longness and one carries roundness, and that out of every eight red gametes one carries longness and seven carry roundness, we find that the calculated composition of a generation produced by such a series of ♂ and of ♀ gametes closely accords with the experimental facts. We know of other cases of this partial coupling of characters, though of the processes of cell division by which it is brought about we can at present say nothing. Enough, however, is known to make it certain that it often plays an important part in heredity, and I have laid some stress upon it because it may eventually be found to throw light upon the alleged association of certain physical peculiarities in man with particular forms of disease.

SEX-LIMITED DISEASES.

It is well known that certain diseases are limited almost, if not entirely, to one sex. In hæmophilia, for example, it is, with the rarest exception, the males alone who are affected. But the disease can be and normally is transmitted by the unaffected female, though not all the females of a hæmophilic family are capable of doing so. The affected male is also known to transmit the disease (*cf.* fig. 7). Besides hæmophilia there are certain other diseases which are known to exhibit a somewhat similar mode of transmission—the “Knight’s move” in heredity, as Bateson has termed it. Among these may be mentioned colour-blindness, night-blindness when associated with myopia, and

possibly also Gowers's disease. Moreover, the data collected by Herringham on peroneal atrophy seem to suggest that here again we are concerned with a phenomenon of much the same class. In all these cases, where the disease is almost exclusively confined to one sex, it is probably not without significance that the males are the ones to suffer.

Though, as we shall see later, the problem of these sex-limited diseases offers points of special difficulty, the following experiments on sheep suggest the lines along which the solution must probably be sought.

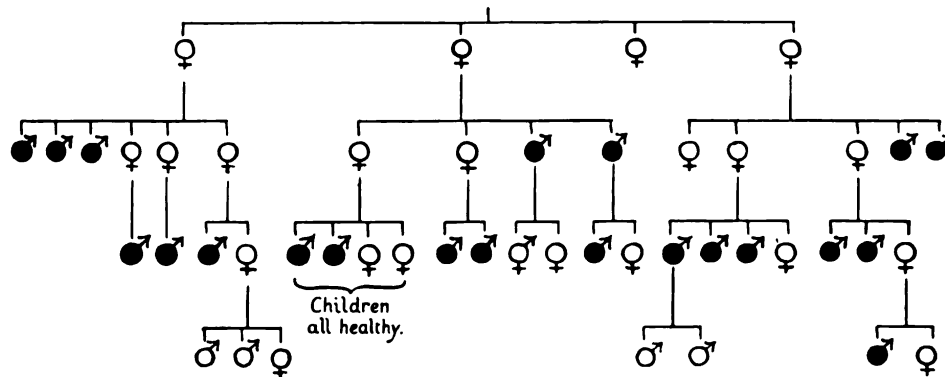


FIG. 7.

Pedigree illustrating the inheritance of hæmophilia (after Stahel).

Professor Wood recently crossed the horned Dorset with the hornless Suffolk breed of sheep. Whichever way the cross was made the ♂ ♂ were all horned and the ♀ ♀ hornless. On breeding together the F_1 's all the four types appeared in the offspring, but the horned ♂ ♂ were three times as numerous as the hornless ♂ ♂, while only one out of every four ♀ ♀ was horned. The simplest explanation is to suppose that horns are dominant in the ♂ but recessive in the ♀. This was tested by a pretty experiment, in which an F_2 hornless ♂ was put on to the flock of hornless F_1 ♀ ♀. On the suggested explanation the F_2 ♂ cannot carry the horned character, but the F_1 ♀ ♀ from their breeding must carry this character. The cross must therefore result in equal numbers of animals pure for hornlessness and heterozygous for horns. Now the ♂ ♂ which are heterozygous for the horned character show it, while the ♀ ♀ do not; hence the expected result of our mating is that half the ♂ ♂ will be horned, half will be hornless, and that all the ♀ ♀ will be

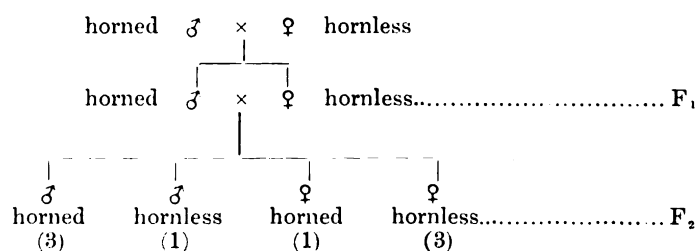


FIG. 8.

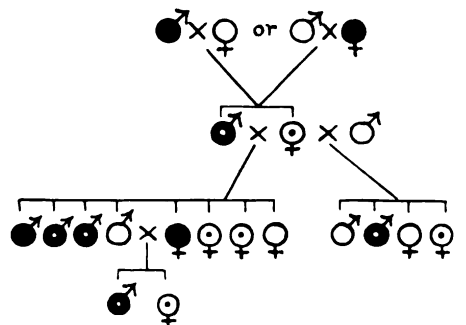


FIG. 9.

On the assumption that horns are dominant in the ♂ and recessive in the ♀, it follows that there are three kinds of males, viz., those homozygous for the horned character, those homozygous for the hornless character, and those which are heterozygous. Similarly the females are

constitutionally of three kinds. But while the heterozygous males are horned the heterozygous females are hornless. In fig. 10 I have drawn up a scheme to illustrate the nine possible forms of mating between our three females and our three males. One point to notice is that while horned females can only appear when the male parent is horned (Nos. 1, 2, 4, 5), the horned males may also arise from two hornless parents (No. 8). Another important point is that all the male offspring of a horned female must be horned (Nos. 1, 4, 7).

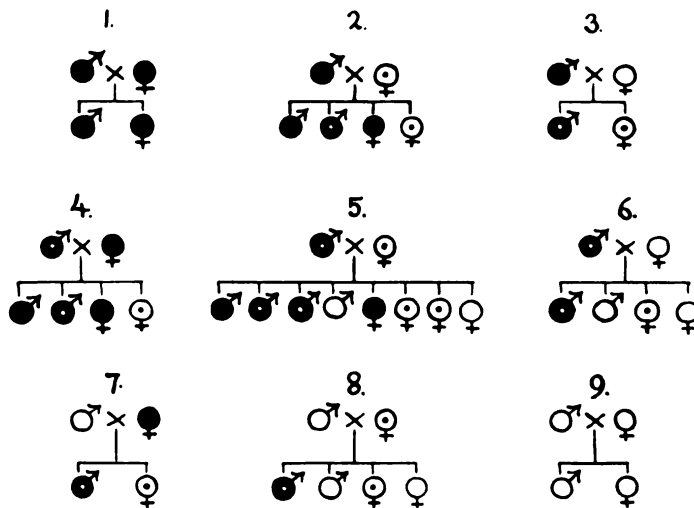


FIG. 10.

Scheme to illustrate the nine types of mating and their results in a case where a character is dominant in one sex and recessive in the other. The character is here represented as dominant in the male and recessive in the female. A heterozygous male is figured as a black circle with a white central dot, and a heterozygous female as a plain circle with a black central dot.

We may now inquire how far this scheme of inheritance fits such cases as those of hæmophilia. A hæmophilic male or a female from a hæmophilic family will almost always marry a normal person outside the family. With the rarest exceptions, therefore, every affected male will be heterozygous in constitution. Consequently the three types of mating with which we are mainly concerned are Nos. 5, 6, and 8. Since a member of an affected family nearly always marries outside of the family, the great bulk of the matings will be of types 6 and 8, and in both of these the male offspring alone are affected. The third type of

mating (No. 5), where an affected male marries a heterozygous female, must be very much rarer than the other two. This type can lead to the production of affected females, but as the chances of such females appearing are only one in four, it must often happen that all the females in these families are normal. The great rarity of female "bleeders" is the natural outcome of the exogamous habits of civilised man.

We have seen that the horned ewe must always transmit the horned character to *all* her male offspring (fig. 9). By analogy we should expect all the sons of a female "bleeder" to be affected. Unfortunately, our data do not allow of this crucial test in the case of hæmophilia, but in the case of colour-blindness there exist a few records of the offspring of colour-blind women mated with normal men. Mr. Bateson tells me that the five such women, about whom he has been able to collect information, had between them twelve sons, *all of whom were colour-blind*, while the daughters, so far as is known, were all normal. It would therefore appear that, qualitatively, the inheritance of these sex-limited diseases is closely comparable to that of horns in sheep.

But Bateson¹ has already pointed out that the proportions in which affected males appear in families of type 8 are far too high. A simple Mendelian interpretation demands equal numbers of affected and unaffected, but, as a matter of fact, the affected males are more than twice as numerous as the unaffected. There is evidently some further complication, possibly some form of coupling between the factors upon which the disease depends and those of sex. That some such form of coupling may exist is rendered probable from the following experiments in animals.

Doncaster and Raynor² have recently investigated the inheritance of the pale *lacticolor* variety of the common currant-moth, *Abraxas grossulariata* (fig. 11). The variety behaves as a recessive to the normal form in both sexes, but, as the accompanying scheme shows, there is only one form of mating from which a *lacticolor* ♂ can arise, viz., heterozygous ♂ × *lacticolor* ♀. For when heterozygous individuals are bred together, or when ♂ *lacticolor* is crossed with a heterozygous ♀, the variety only appears in the female offspring. From these results the authors have made some interesting deductions concerning the nature of sex, but for our purpose it is sufficient to call attention to them as illustrating a form of coupling between sex and another character which is somewhat different to any other at present worked out.

¹ *Brain*, 1906, xxix., p. 157.

² *Proc. Zool. Soc.*, 1903.

A more complicated case at which Mr. Bateson and I are at present working concerns the inheritance of a peculiar deeply pigmented condition of the skin and connective tissues found in the silky fowl. This breed we crossed with a brown Leghorn, and obtained the following



FIG. 11.

The current-moth, *Abraxas grossulariata*, and its pale *lacticolor* variety.

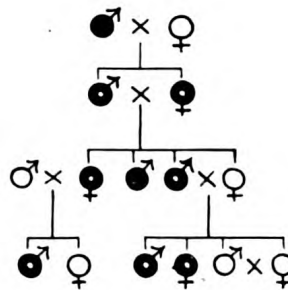


FIG. 12.

Scheme to illustrate the inheritance of the *lacticolor* variety of the current-moth. Pure *grossulariata* shown black and heterozygotes black with white central dots.

results: From ♀ silky × ♂ brown Leghorn the F_1 birds were practically unpigmented, and such birds bred together gave pigmented and unpigmented birds of both sexes. So far, this is a commonplace result.

But a remarkable point comes out in crossing the F_1 birds with pure unpigmented brown Leghorns. The F_1 ♀ × ♂ brown Leghorn gives only unpigmented or practically unpigmented birds. But ♀ brown Leghorn × F_1 ♂ gives a definite proportion, 1 in 8, of pigmented birds; *and these are always ♀ ♀*—again the “Knight’s move.” The unaffected ♂ can transmit, but only to the opposite sex. The difference in the transmitting power of the two sexes is still more strongly brought out when the ♀ brown Leghorn is mated with a ♂ silky. In such an experiment we found that the ♂ ♂ were practically unpigmented, but that all the ♀ ♀ were pigmented. The case is in reality more complicated than I have here indicated, owing to the occurrence of different grades of pigmentation and for other reasons. Nevertheless we hope soon to put

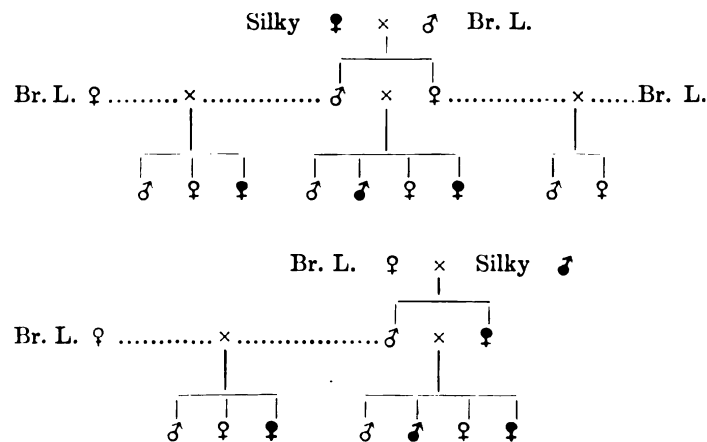


FIG. 13

forward a scheme to cover it. The explanation will probably involve the conception of sex as a character transmitted on Mendelian lines, together with the existence of gametic coupling between the factors influencing pigmentation and the sex factors. More at present we cannot say, but these facts are sufficient to indicate that cases not dissimilar to those of the sex-limited diseases in man occur among animals, and we may reasonably hope that the solution of the problem of the silky fowl will throw further light upon diseases like hæmophilia and peroneal atrophy.

There is little doubt but that a knowledge of Mendel's principles must be of value in the study of disease, for when once Mendelian analysis has established the operation of the law, and the nature of the

characters concerned, we are in a position to predict, always the probable, sometimes the inevitable, result of a given mating. When a brachydactylous man marries a normal woman we are certain that there is an even chance of any given child being born diseased or normal. When two normal people with night-blind parents and grandparents marry we may predict with confidence that none of their children will inherit the disease.

But before the Mendelian nature of a disease can be established, full and accurate pedigrees must be forthcoming. And in the collection of such pedigrees too much emphasis cannot be laid upon the necessity of paying as much attention to the normals as to the affected, for the interpretation turns as largely upon their behaviour as upon that of the diseased.

The pedigree accomplished, the next task is that of reading it. If it is a simple case of dominance and recessiveness this will be an easy matter. If it is more complex the key may possibly be found in some one or other of the standard cases which have been, and are now being worked out in plants and animals; for careful experimental work in animals and plants must for a long time be the basis upon which the student of human heredity will have to build.

But, perhaps, after all, our pedigree may prove refractory, and may refuse to take its place in any known hereditary scheme. In such cases we may be dealing with a disease which is not, in the true sense of the word, hereditary, because not represented in the structure of the gamete, but, like syphilis, is caused by a foreign invasion. It is in the hope of gaining information from those who are so well qualified to speak upon these matters that I would venture to suggest that diseases fall into at least three classes:—

(1) Diseases which depend directly upon a structural change in the gamete, either by the addition or subtraction of some character as compared with the normal, *e.g.*, night-blindness, brachydactyly, alkaptonuria.

(2) Diseases in which such structural change of the gamete is without visible effect, but which renders the individual liable to invasion by bacteria, &c. The disease is not manifested unless the structural change and the external organism are both present; *e.g.*, rust in wheat.

(3) Diseases caused by external invasion, for which immunity, as implied by gametic structure, is not known to exist, *e.g.*, syphilis, ankylostomiasis.

Of these three classes we should expect (1) and (2) to exhibit the phenomenon of Mendelian heredity in some form or another. But class (3) is of an entirely different nature, and cannot be inherited in the biologist's sense of the term. It seems not inconceivable that Mendelian analysis may be sometimes valuable as a criterion for separating this class of disease from the others. Undoubted non-Mendelian inheritance may possibly in some cases suggest renewed search for a parasite hitherto overlooked.

In conclusion, may I express the hope that those present to-night will not let slip such opportunities as they may have of collecting evidence upon the transmission of disease? Except in a few cases the available data are scanty, nor are they always of great value owing to a not unnatural tendency to pay less attention to the normals than to the affected. To-day we realise that all are equally important. It is only through complete records that we can hope eventually to disentangle the complexities of inheritance—to determine the unit characters involved, and to state our problems clearly to the chemist, with whom the solution must ultimately rest.

DISCUSSION.

The PRESIDENT (Dr. Newsholme) said that Mr. Punnett's address had been a most valuable and interesting one, as well as the demonstration, opening up a large field for discussion by both physicians and epidemiologists.

Dr. H. M. VERNON (Oxford) sent a communication, which was read by Dr. G. S. Buchanan. The writer regretted his inability to be present and said that medical men should feel greatly indebted to Mr. Punnett for describing to them the recent work on Mendelism, but he hoped that they would not be carried away by the idea that it was the one all-important question of heredity, especially in regard to hereditary disease. All the three diseased conditions quoted by the author of the paper were very rare ones, probably not present in more than 1 per 100,000 of the population, yet those were the best instances he could adduce of the working of the law. Also in regard to normal characters, Dr. Vernon believed that eye-colour alone (and possibly to a slight extent hair-colour) have been shown to conform at all with the law. All the other measurable characters in man and cases of hereditary transmission of disease (as insanity, gout, disposition to tubercle, &c.) had nothing to do with the law, as far as could be seen. The gametes corresponding to such characters were able to blend and form blended zygotes, which gave rise to blended gametes and not segregated alternative ones, as was required by Mendel's law. The vast amount

of work done by Galton, Pearson and others on the transmission of such blended characters and their relation to the characters of the parents, grandparents, &c., was practically ignored by the Mendelians. For the average medical man a knowledge of the laws of ancestral heredity, as defined by the workers mentioned, appeared more important than a knowledge of the segregated transmission of a few very rare diseases, interesting as such cases were.

Dr. A. E. GARROD, referring to the suggestion contained in Mr. Punnett's paper that alkaptonuria might result from the absence of an enzyme which brought about the disintegration of the benzene ring of the aromatic fractions of proteins, said that this view had been suggested in several quarters on quite other grounds than those of heredity, and that from the standpoint of chemical physiology there was much to be said in its favour. He called attention to the difficulty of obtaining satisfactory evidence of the occurrence of such chemical "sports" in the families of the patients. Although alkaptonuria was a fairly evident anomaly it was not easy to find out whether members of back generations of a family had stained their napkins in infancy or had passed urine which darkened on standing. In connection with cystinuria the difficulty was still greater, seeing that many cystinurics did not form calculi or develop any conspicuous urinary troubles. Hence, for such anomalies it was practically impossible to construct family trees showing, with any degree of accuracy, the numbers of normal and abnormal members in successive generations. The bearing of the Mendelian theory upon the question of the effects of consanguineous marriages, to which Mr. Punnett had not referred in his paper, appeared to Dr. Garrod to be of extreme interest. The literature dealing with this subject was most unsatisfactory, and most authors had set out to show that consanguineous marriages had or had not evil consequences for the offspring. On the other hand, the explanation that a rare recessive character was most likely to appear in the offspring of the intermarriages of members of a family who produced the recessive gametes seemed to remove the question beyond the zone of prejudice and to explain in a satisfactory manner why so large a proportion of human recessives, such as albinos and alkaptonurics, were the offspring of marriages of first cousins. It also explained the undoubted connection between such marriages and the appearance, in several children of a family, of an anomaly which had not manifested itself in immediately preceding generations.

Mr. MAJOR GREENWOOD, JUN., said he felt that, as a pupil of Karl Pearson, he ought to say something with regard to the Mendelian school, and support to that inclination was afforded by Dr. Vernon's letter, there being a tendency, apparently, on the part of the Mendelians, to sing a *Te Deum* on the slightest provocation. Not so much in Mr. Punnett's exposition as in the proof of the paper which had been circulated, there was a long list of the conquests achieved by the Mendelian school, and, in face of that, the adherents of that school had no right to complain if criticism were minute in view of its being asserted to be *the* theory instead of *a* theory of heredity. It was desirable to know what meaning the Mendelians attached to the word "proof." A statistician recently

—perhaps enraged by Mr. Lock's peculiar ideas on the subject of regression—said that approximations could be classified into three groups: close approximations, rough approximations, and Mendelian approximations. But, apart from Mendelian approximations, the experimental side of the question was rather interesting. With regard to moths, to which the author had briefly alluded, Mr. Doncaster, a Mendelian who had worked on that subject, as a result of his own and other people's experiments on several species, concluded that black wing coloration was, in general, a dominant character in the absence of purple, purple being dominant over black in moth breeding (Prout's *Ferrugata*). In studying that subject, Mr. Prout, the leading English authority on Geometrid moths, concluded that the geometers offered, for breeding, a good field in the direction under discussion. There were two very well marked forms of *Acidalia virgularia*—one in the South of France and the other around London, the melanic variety. The non-expert could readily distinguish those two varieties. They were bred for six generations, and were found to breed perfectly true. Prout and Bacot then obtained specimens from the South of France, and crossed them with specimens from Clapton. Seven or eight crossings were made, and they reared the first generation, and from the pairs seven generations had been bred through, about 2,500 moths resulting. Examination showed that there was not a trace of segregation; in each generation there was a blend. That was of very special importance, because Mr. Prout had not taken up moths as a pawn in the game, but as a student of geometers; and one knew that an entomological specialist was a man who was very keen on creating differences where none existed or where none were apparent to other people. If such a man could not distinguish between offspring, it might be concluded that no segregation had taken place. Mendelians might say that was not a simple unit character; but what was to be the criterion of the unit character? If melanism were a simple character in Doncaster's cases but not here, then the definition of a unit character was: a character which was inherited according to Mendel's theory. That had a superficial resemblance to arguing in a circle. Years ago, Professor Karl Pearson published a paper in which he showed that on the scheme propounded by Galton parental regression would be, in general, linear, but on the Mendelian theory, as then propounded, it would take the form of a hyperbola. There were many things about the Mendelian theory which might be hyperbolic, but he doubted whether regression was one of them, and the scheme had been so modified since that he thought one was entitled to ask for a definition of unit character. With regard to night-blindness, in regard to which such a splendid pedigree was exhibited, it was said to be due to the absence of visual purple in all probability. But later it was more than a suggestion and was fitted into the scheme. It would be interesting to hear Mr. Punnett's evidence that absence of visual purple was the cause. He believed it was a deduction from a theory. In 1883, Parinaud and von Kries simultaneously propounded the theory that normal vision depended on a double mechanism: one affecting the cones and fovea, giving ordinary daylight vision, and the other associated with the rods of visual purple, which was characterised by sensitivity

to feeble light, and might be regarded as the twilight factor. They suggested that night-blindness might be a condition in which the visual purple of the rods was either absent or functionless. Everyone would be glad of proof of the statement. The only way of testing it would be to inveigle a subject of night-blindness into a dark room, keep him there two hours, kill him, and then remove the retina and soak it in bile-salts, which, of course, was not done in any of the cases. Messmer¹ examined a small number of cases very carefully, and announced that the night-blinds could be differentiated into cases in which dark adaptation was quite normal when produced, but there was a very long latent period. But the other type had a normal reaction-time after being brought into the dark, but when the adaptation was produced it was very feeble in extent. So that night-blindness was probably not the simple thing which could be represented by black dots in a pedigree chart; it was not simply a question of being night-blind or not night-blind, hornless or horned, but there were gradations. In the night-blinds discussed by Mr. Punnett, Mr. Nettleship admitted he could not examine all the cases, and the conditions did not favour him. So the suggestion was that, at least in regard to night-blindness, there was not enough knowledge to enable it to be dismissed in the simple way suggested by the ingenious Mendelians. It would be better to collect much larger statistics of the various commoner pathological conditions. He need not refer to tuberculosis, which Karl Pearson had recently investigated. Assuming that the tubercular predisposition was a simple recessive character, he showed that the scheme failed utterly, the disproportion between the predicted and the actual in one case being as 57 to 100, which he, Mr. Greenwood, thought was outside even the Mendelian limits of approximation. Therefore, in regard to pathological conditions and inheritance, they had no right to regard these conditions as being so simple as to permit of their being summarised in a simple Mendelian pedigree.

Mr. UDNY YULE said he spoke simply as a statistician who was interested in the question of heredity. He was at one with Mr. Greenwood in being less hopeful than the author as to the wide applicability of the Mendelian principles to state medicine. Two distinct and important points arose out of the paper: first, as to the applicability of the principles; secondly, as to the increased effectiveness of state medicine, granted even that those principles were widely applicable. Many of the cases dealt with by the author referred to the inheritance of abnormalities rather than to disease properly so termed, *e.g.*, such diseases as tuberculosis or insanity. Supposing a definite germinal characteristic decided whether or not a person should have the tubercular diathesis, that did not mean that that man would certainly have tuberculosis, merely that he was liable to have it; he might die of something quite distinct, after living as long as the normal man. And was not that the case in regard to most diseases? The matter was extremely complicated, even if the germinal processes were Mendelian. In reading Karl Pearson's investigation concerning tuberculosis and Heron's on the inheritance of insanity he had not felt satisfied with the

¹ *Zeitschr. f. Phys. und Psych. d. Sinnesorg.*, xlii., p. 83.

arguments as to the non-applicability of Mendelian principles to the germinal processes, so he went into the question himself, and in the end he had not felt convinced whether the Mendelian principles applied or no. If insanity were recessive, all we knew was that a man exhibiting insanity was a pure recessive. But his sane mate was not necessarily a dominant, nor a heterozygote, but might be also a pure recessive who simply had not had time or opportunity to exhibit that character. The case was much more complicated than a first consideration would lead one to suppose. Matings between sane persons might be matings between pure recessives, between recessives and heterozygotes, or between dominants. In what proportion was the various mating likely to occur? One could only form some theory on the assumption of random mating, and that he had tried, but the proportions of insane offspring did not work out very well. Quite obviously their divergences from the observed were outside the limits of probable error. Further, if the mating were really random, one would not get a random selection of such matings between recessives and heterozygotes by taking those matings in which at least one of the offspring was insane, because mating recessives with recessives would give a larger proportion of insane cases amongst the offspring than would the mating of heterozygotes with recessives. After all, what had to be dealt with was the character which was exhibited, and he agreed with the last speaker that in cases like these the actuarial method was likely to yield more valuable information to the medical man than a discussion on the basis of germinal laws, which might hold for the germ-cells but need not hold for the body, seeing how much the element of circumstance entered into the matter. Other factors as important as heredity must be taken into consideration. The actuarial statement included what the germinal statement did not, namely, those factors of disturbance which were of equal importance with the factors of pure heredity. It was necessary to know, for example, in how far selection operated on the different types of character which were subject to heredity; how far there was selection by death; how far by non-marriage, and, if such person did marry, how far there might be selection by fertility or non-fertility in the case of persons possessing one character or another. The importance of such disturbances seemed to be enforced by some of the figures illustrating the Mendelian cases, which puzzled him very much. Assuming that brown or duplex eye-colour was dominant over blue, if matings of persons of different eye-colours were random (and that was very nearly true), it was to be expected that in the population there would be three persons with brown eyes to one with blue; but that was not so. There were more blues than browns. The same applied to the examples of brachydactyly. The author said that brachydactyly was dominant. In the course of time one would then expect, in the absence of counteracting factors, to get three brachydactylous persons to one normal, but that was not so. There must be other disturbing factors of equal importance. Finally, to pass to his second point, he doubted whether the theory would at all largely increase the physician's effectiveness in state medicine. On that point Mr. Punnett seemed to be extraordinarily hopeful. Supposing it were found that a certain diathesis

was subject to Mendelian principles, did one advance much further, either in treating the individual or in taking general measures? Could the physician do more in the light of such knowledge than he could now? Could he do more than endeavour to keep the individual free from infection and from predisposing conditions? It had been suggested by many writers that the characters were amenable to human control by controlling marriage. That, however, seemed to him a chimerical idea, and not in the bounds of the practical at present. Further, in such cases as tuberculosis and insanity, where one could not be certain as to the germinal constitution of the individual, even marriage control would largely break down. He concluded by thanking the author for his paper.

Dr. T. LEWIS said that, in dealing with deformities of the hands and feet, certain cases had been given by the author as instances, which agreed fairly well with the Mendelian theory. But it was important to take account of the fact that there was a tendency for the condition to die out in successive generations. In examining a number of cases of deformities of the hands and feet he had found that to be true. That was the crux of the whole matter in its applicability to disease.

Dr. FREMANTLE asked what was the area over which the author took his human statistics. If it was as small as it appeared to be, the margin of error was far too great. Still-births and, moreover, miscarriages could not possibly have been included. If they were not taken into consideration in drawing conclusions, for instance as to night-blindness, it seemed to him that those conclusions must be thrown out of gear. Secondly, having established full and accurate pedigrees, including still-births and miscarriages, it became necessary to interpret them, and in doing so it was necessary to come back to the original principle: that inheritance of various qualities depended upon the union of the gametes. It was surely only one single spermatozoön out of 50,000 at the very least which was selected by various chances in the process of impregnation to form the offspring; and it was pure chance whether that spermatozoön had the particular characteristic in the dominant or in the recessive. Surely the element of chance was mathematically so enormous, and the characters of any importance so complex, that only an inconceivably large number of offspring could eliminate chance and represent the mathematical bringing together of the gametes which had been represented.

Sir SHIRLEY F. MURPHY thought the Section ought to thank Mr. Punnett very much for his excellent paper, as the subject matter of it was full of interest. Mendel's law seemed to be established for certain characteristics and within certain limits. How far it might go beyond that was a matter for further enquiry and research. One could not imagine conditions under which Mr. Punnett was going to interfere with the ways of love, but the theory had arrived experimentally at the stage of being of considerable importance to the agriculturalist, and even if it did not go beyond that it would have served its purpose. The interest of that Section in the matter was not as to how far it could be applied, but how far the law was one by which Nature worked. He

moved a hearty vote of thanks to Mr. Punnett. This was supported by the President and carried.

Mr. PUNNETT, in replying to Dr. Garrod, said it was possible for a diseased (or anomalous) individual to come from two normal parents even though the diseased condition behaved as a dominant to the normal. Among poultry colour was in certain cases dominant to white, yet, when two pure white strains, each recessive to colour, were crossed only coloured birds resulted. Two things were necessary for the production of colour in this case, and absence of either resulted in a white bird. Such experiments suggested that many of the enzymes might be of a double nature, and he believed that this had already been shown for the action of diastase on starch and for the lipolytic action of the liver-cells. The case of the moth, cited by Mr. Greenwood, was a very rare one, and interesting on that account. Mr. Bateson had come across another such case in a butterfly (*Pararge egeria*). Much more experimental work was required upon the heredity of these forms, and until it was forthcoming it was safer to suspend judgment. Dr. Greenwood had asked for a definition of a unit character. He would to-day define a unit character as one which exhibited Mendelian heredity. It was a crude definition, but it could be tested by facts, and facts, after all, were the basis upon which the Mendelians were building. With regard to the absence of visual purple in night-blind people, he was quoting a view which he understood was generally received among those most qualified to judge. He quite agreed with Mr. Greenwood that the experimental method was the only way of settling this, as well as many other questions connected with heredity. But whatever the cause or causes it made no difference to the facts of transmission of night-blindness. Mr. Greenwood's argument that the inheritance of tuberculosis was non-Mendelian depended on the assumption that the tubercular predisposition was a simple recessive character. He wondered what medical men would say to that, for he had always understood that the etiology of the disease was by no means simple. He was certain that no Mendelian would have the temerity to-day to make the assumption upon which Mr. Greenwood's argument was based. Mr. Yule wondered why the nation was not slowly becoming brown-eyed and brachydactylous, since these characters were both dominant. So it might be for all he knew, but this made no difference to the mode of transmission of eye-colour or brachydactyly. In regarding the breeding of man as mixed up with all manner of conventions and prejudices he quite agreed with Mr. Yule, but these were matters concerning ethics rather than heredity. Dr. Lewis suggested that the brachydactylous condition tended to die out in successive generations, presumably as the result of crossing with the normals. He could not agree with this optimistic view. A glance at Dr. Drinkwater's table, for instance, showed that in the last generation the children of brachydactylous people were relatively just as numerous as ever, and were almost exactly the expected 50 per cent. of the total. Dr. Vernon's letter raised the old controversy between the Mendelians and the biometricians, and dwelt upon the practical value of the law of ancestral

heredity as defined by Pearson and others. But it did not seem to him that a law which utterly collapsed before such simple facts as the production of colour from two pure strains of poultry or sweet peas was likely to be of much value to the average medical man or to anybody else. Mendelian inheritance has now been demonstrated for numbers of most diverse characters in plants and animals. It has also been shown to hold for a few simple cases in man where the evidence has been collected carefully and critically. How far it applies must be a matter of opinion until much more in the way of accurately recorded pedigrees is forthcoming. Facts alone can decide the matter, and if this paper did a little to stimulating the collection of such facts it would have amply repaid whatever pains went to the making of it.

Epidemiological Section.

March 27, 1908.

Dr. A. NEWSHOLME, President of the Section, in the Chair.

A DISCUSSION ON THE ETIOLOGY AND EPIDEMIOLOGY OF TYPHOID (ENTERIC) FEVER.

Introductory Address.

By EDWARD C. SEATON, M.D.

By way of briefly introducing this subject for discussion, it may not be inappropriate to recall the statement once made by a very eminent practising physician of the Victorian era. It was far back in the seventies. The occasion was somewhat similar to the present, and the speaker to whom I refer was the famous Sir William Gull. His words were to the effect that the water-borne doctrine of typhoid causation was a very good working hypothesis, but nothing more. But great as was the authority that men were wont to attach at that time to the utterances of one who shared with Sir William Jenner the credit of having saved the life of the Heir-Apparent to the Throne, his concise statement was by no means accepted as an apt description of the dominating view of the time.

The rising school of epidemiologists had amongst its founders experts who, by their exact studies of outbreaks of epidemics, by their clear reasoning thereon, and by the scientific character of their researches and brilliant reports, had succeeded during the previous ten years in enlightening the people as to the causation of cholera and typhoid in this country. They had been able, in fact, to show definitely, with mathematical precision, how epidemics of these diseases, which had been referred to vague influences of one kind or another, rose and spread. To

those prepared to follow in the footsteps of their leaders, such a sweeping statement as that referred to appeared both unappreciative and misleading, for they naturally argued that, given workers of sufficient acumen and industry, together with the opportunities that had been afforded to the eminent pioneers of the Public Health Service, every considerable outbreak of these diseases would be found traceable to water supplies, and even the few cases that occurred in detached or sporadic form would in some way or other be connected with the same source, as, for example, through milk infected by polluted water.

But, looking back from our present standpoint, may we not well ask whether Gull's assertion was very far wrong even thirty or thirty-five years ago? Mark you, Sir William emphasised the fact that the water-borne view was "a good working hypothesis," and so it undoubtedly proved to be in after years, both at home and abroad. Nay, further, may we not even say that it is still a good working hypothesis at the present day, when we reflect that there still remain sources of public water supply constantly exposed to danger, and liable to be delivered to consumers in an unpurified condition?

But the subject we have set ourselves to consider this evening is very different, for it is nothing less than the whole problem of typhoid causation at the present day. In order to discuss this fairly it is essential to reduce the water carriage factor to its proper proportions. As time is short, I will endeavour to do this by putting before you a few considerations which strike me as being of cardinal importance. I will take them in chronological order.

In the first place, going back to the decennial period, 1873 to 1882, how many of us who were working in the large towns of England (away from the metropolis) can be said to have succeeded in tracing outbreaks to polluted water supplies? On the other hand, were there not a few who, working in large towns where typhoid incidence recurred heavily every autumn—more especially in certain quarters where the abominable midden system and other air- and food-polluting agents existed—could not fail to note at the same time, and in the same localities, that the public water supply was pure and abundant, being, in fact, delivered on the constant system, and, moreover, free from suspicion of contamination in its passage from the source to the standpipe or tap, such as that first demonstrated many years ago at Cambridge, Sherborne and elsewhere? I could give examples, under such circumstances, of failure to sustain the water-borne doctrine from my own official experience, which, judging from contemporary reports, was, I suspect, by no means singular.

Again, taking the next decade, 1883 to 1892, when lake water supplies had been and were being captured for the use of large cities, and water of the highest organic purity was being furnished to communities, including the dwellers in slums, the fact that typhoid persistently continued to recur in the autumn furnished an even more striking manifestation of the fact that typhoid prevalence is only to a limited extent dependent on the purity of public water supplies. For instance, there is the experience of the large towns of the North. Do they not clearly indicate that water-borne infection cannot possibly be a principal factor in the causation of typhoid?

Indeed, by the time we reach 1893, it seems to have become only too manifest that a polluted water supply was not by any means the sole or general means of conveyance of the disease, and attention was being directed to such agencies as dust and flies, and, above all, to the direct effect of polluted or unwholesome foods.

Coming now to the period since then—viz., the fifteen years from 1893 to 1907 inclusive—we are furnished with negative evidence of even a stronger character against the view with which we started. By this time notification had become universal in operation, and medical officers had become increasingly devoted to their special work, so that in a very large proportion of cases of illness inquiries were made at once, and pains were taken to ascertain the facts of the circumstances attending the date of attack—*i.e.*, some two or three weeks before the onset of illness.

I have lately had the opportunity of summarising the results of such a study, as is now possible, in the various parts of England. They are fully given in the last Annual Report to the Surrey County Council, and are illustrated by a series of diagrams (submitted). I think we shall all agree that it is the rural districts that afford the best opportunities for exact observation. Such observations have been diligently made and carefully recorded in the County of Surrey. In studying the reports thereon it will be often noted that the persons attacked are at work during the daytime in London, and there is always the possibility of their having caught their illness there.

To those who start with the assumption that the London water, because of its somewhat impure condition when taken from the River Thames, is therefore a potential cause of typhoid, the mere fact of drinking a glass of water from a London source would be a sufficient cause. But that is obviously begging the whole question which we are now considering. To another aspect of this part of our subject I shall have to presently return.

In the meanwhile I repeat it is the country districts that afford the best opportunities. Now, besides having of late years had the opportunity of observing carefully a great deal for myself, I have further had the great advantage of studying very carefully reports of my old colleague, Mr. E. L. Jacob, who personally investigated every case reported to him. He used to record the observations he made in his reports very methodically, noting not only both the date of the attack as well as the onset of illness, but recording as well any imperfections in sanitary conditions at homes and any ascertainable circumstances throwing light on the possible cause of illness if contracted away from home. Looking back through these reports, which extended over a period of twenty to thirty years, they contain, as might be expected in the early days, notes of insanitary conditions in the vast majority of cases, for the simple reason that insanitary conditions, such as leaking privies, drains, and fouled wells, were at that time the rule rather than the exception. But my former colleague always recorded in a separate column those cases where, apart from mere coincidence, he thought there was distinct evidence connecting a polluted water supply with the occurrence of illness as cause and effect.

These reports have been gone through very carefully, not only by myself, but by my friend, Dr. Fox-Symons, in order that we might tabulate and compare our results independently. I will sum them up by saying that although there were undoubtedly a large proportion of cases, more especially in the early days, in which Dr. Jacob would have declined to say that the insanitary conditions noted were not connected with the illness, yet the proportion of cases where he may be said to have found satisfactory evidence of causal relationship was much less than sanitarians would have expected, the origin of most of the cases being frankly entered as doubtful or unexplained; while the cases distinctly attributable to drinking water were much less than 10 per cent. Dr. Jacob's reports led to much-needed sanitary reforms, and his work may be said to have been a good justification of the "working hypothesis" views, inasmuch as they helped to close at least one door through which infection undoubtedly takes place.

It may be added as a significant fact that when the connection of polluted or diseased foods came into notice as a factor in the production of typhoid cases, a comparatively large proportion of these were cases in which the relationship of cause and effect might have been said to have been established.

Last year I published the results of some observations in the county

of Surrey based upon a study of the notifications for twelve years and a study of the notifications in relation to the rainfall as affecting what might be called the water theory, and so far as those observations go they appear to be of a negative character. In the whole of the twelve years now under notice there has not been a single epidemic of water-borne typhoid in the administrative county. The prevalence of the disease during this long period has been endemic in character, that is to say, chiefly made up of solitary cases or groups of cases confined to one spot—sporadic outbreaks, as they are commonly called.

Taking the whole of the 2,100 cases now under review as regards their causation, I think it very doubtful whether as many as 10 per cent. can be said to have been actually caused by the drinking of a polluted or infected water supply, either in Surrey, where the patients fell ill, or at the place where their illness was contracted some two or three weeks before.

Coming now to the question of rainfall and its effect on typhoid prevalence I have considered the matter separately as affecting the populations supplied from different sources, viz.: (1) the River Thames [population 253,000] and those from (2 and 3) subterranean (sand formations [population 137,000] and chalk formation [population 147,000]). The results of the calculations of the relation of typhoid cases to rainfall are set forth in tables which have been gone through most carefully and which are in print in the report.

The tendency of typhoid to increase in the autumn season is shown, whatever the source of water supply may be and whatever the rainfall may be. As regards the river water supply it has long been contended by the experts of the London County Council and others that a heavy rainfall, leading to floods and a general washing of manured lands and sewage into the river, and consequent strain put on filtration systems, must increase the risk of typhoid to the river water drinking population. The diagrams, however, furnish no evidence of this having occurred. Indeed, as regards what they tell us, it would seem their information is of a negative character. They show a gradual decline in the sum total of the typhoid prevalence, and they generally show an autumnal increase, which is observed everywhere, whether the water supplies are derived from lakes, rivers or water-bearing strata. There is no evident relation between the rainfall and consequent floods to typhoid prevalence. But, though negative in character, the evidence of the upper diagram (namely, that relating to river water) is of considerable value. The period included is subsequent to 1894. In that year it will

be remembered that the medical officer of the London County Council made a report that suggested that the November incidence of typhoid in the metropolitan area synchronised with the occurrence of heavy autumnal rainfall and flooding of the Thames valley two or three weeks before, that is to say, the interval between "flood" and "incidence" coincided with the incubation period of the disease. Now there is nothing to show that any such connection of possible cause and effect since that time may have taken place in the part of the administrative county which derives its water supply from the same source as London, for if on the one hand we take the long established official view that typhoid is mainly a water-borne disease there must certainly have been some indication of the effects of floods in the diagrams. The defences against the effects of pollution by subsidence tanks and increase of filtration areas have been in progress during the last seven years, but they are not yet complete, and were much less so four years ago. If we look back to the year 1903 the evidence appears decidedly against the London "water theory." If, on the other hand, we conclude that it has been too readily assumed that typhoid outbreaks generally, or even frequently, have their origin in pollution of water supplies, we should hardly expect markedly visible evidence of the connection of rainfall and typhoid in any case.

There is, indeed, no reason for supposing there has been a simultaneous distribution of typhoid in Surrey resembling that to which attention was directed in London in 1894. Neither, so far as I am aware, has any similar occurrence taken place in London since the date referred to above. As regards the other indications of the diagrams much interest attaches to that relating to the Chalk water supplies. The contention of some experts has been that a quickening of the passage of polluting matters through the earth when the springs rise rapidly after periods of heavy rainfall adds to the chances of pollution. There again the evidence with regard to the contamination of the chalk area, and its effects on subterranean sources of water supply, by the pollution at great distances through fissured chalk, and even through masses of unfissured chalk, seems absolutely negative.

I would not have it supposed from the above statements that I am in the least degree unappreciative of the real danger that exists from water pollution infection at the present moment. The comparatively recent occurrence, especially that at Basingstoke last year, to say nothing of the Maidstone and Worthing epidemics, show us what a real danger the polluted water supply is, and no one who has witnessed, as I have, the

effects of such an epidemic as that at Maidstone can doubt for a moment the propriety of urging every reasonable precaution for preserving the purity of water supplies which are actually exposed to contamination, or, as in the case of a water supply derived from a necessarily contaminated source, as that of the River Thames, the paramount necessity for proper means of purification being insisted upon at the present day. Such measures would have obviated the disasters in the Tees valley and at Lincoln. I would go further and say that in certain cases the rules as to subsidence and filtration of river waters should be made compulsory, and the possible risks of water derived from such strata as the chalk formation in populous areas should be dealt with in a much more drastic way now than formerly. Moreover the experience of such an outbreak as that at Mountain Ash, which attracted so much attention years ago, and has been dwelt upon so frequently by the supporters of the "water theory," is one that should never be lost sight of, and the rules for the preservation of water while in the mains from possible contamination by insuction of sewage are most important points to be borne in mind.

But the question before us this evening is not whether reasonable rules should be rigidly applied to the preservation of water supplies from dangerous contamination, and their purification previous to supply, if such contamination have taken place, but whether in the mass of typhoid fever which we have to deal with every year we may not be thinking of the polluted water doctrine too much, to the neglect of other more tangible and immediate sources of mischief. That is the question of the hour, and with these preliminary remarks I leave it for others to discuss.

Typhoid Carriers, with an account of Two Institution Outbreaks traced to the same "Carrier."

By D. S. DAVIES, M.D., and I. WALKER HALL, M.D.

THE occasional persistence of the *Bacillus typhosus* in the human body over long periods has been recognised for some years, and the possibility that this condition might afford the explanation of obscure outbreaks was suggested by Horton Smith in his Goulstonian Lectures in 1900 [16]. At that time it was generally accepted that the *Bacillus typhosus* could be demonstrated in the stools, if care was taken, during the first and second and early part of the third week of the disease, and possibly during the early part of the relapse. Later than this it could

not be demonstrated by the laboratory methods then available. It was known, however, from the experiments of Chiari [4], that the bile in the gall-bladder contains the *Bacillus typhosus* in the majority of typhoid cases, and often in pure culture.

It was naturally supposed at first that, as the fever passed away and as health returned, the bacillus, the cause of the disease, would disappear from the tissues also, and this was demonstrated to be the case in some of the earliest observations. But the experiments of Blachstein and Welch [1] showed that sometimes, at least, the typhoid bacillus might remain for much longer periods; experimentally, in rabbits, it was found in the bile 128 days after the date of inoculation, and this suggested that the same thing might occur in man. Between 1894 and 1896, Buschke [3], Sultan [18] and Bruni [2] quoted cases in which the bacilli were found in the pus from bone abscesses, in two instances six years after the primary fever and in one case seven years after. Hunner [7] quotes cases in which cholecystitis was shown to be accompanied by the presence of the *Bacillus typhosus* in pure culture, in one case three months after the fever, in another eight months, and in a third after an interval of seven years. Von Dungern [6] records a case in which, fourteen and a half years after the attack of typhoid fever, the bacilli were still present in pure culture in the cystic contents [5].

These facts, with many others, were detailed by Horton Smith and insisted upon by him as possible sources of reinfection, but they have remained largely ignored in their epidemiological relationship, partly because the assumed rarity of their occurrence suggested that they were merely bacteriological curiosities and partly because the isolation of the *Bacillus typhosus* from the fæces was at that time not only difficult but very uncertain. In 1906, however, owing to the continued prevalence of sporadic typhoid in South Germany, the subject was taken up with the advantage of modern and more certain laboratory methods, and Klinger [10] found that persons in apparent health can harbour typhoid bacilli and excrete them. The German observers divide "carriers" into two classes:—

(1) "Acute carriers," who have shown no symptoms, but, after being in direct contact with patients, may carry and excrete bacilli for a short time and in small numbers.

(2) "Chronic carriers," who have a short or a long time before gone through a regular attack of typhoid and may excrete for months or years more or less pure cultures of typhoid bacilli.

The "chronic carriers" are obviously the most dangerous class; about 4 per cent. of typhoid patients appear to become carriers; the condition is most common in women, and the bacilli apparently are harboured in the bile in the gall-bladder or in the intrahepatic bile passages, whence intermittently they are discharged and excreted with the fæces. This condition may persist for as long as twenty-nine years [5]. When these chronic carriers are engaged in the preparation of food, or in dairy work, they are apt to give rise to intermittent local outbreaks of typhoid fever, probably by contamination of the food with the hand after defæcation or micturition. Kayser [8] quotes the case of a proprietress of a bakehouse at Strasburg who prepared the meals for the employés, where each journeyman developed typhoid soon after arrival; her stools were full of bacilli and she gave a distinct Widal reaction (1—100). Soper [17], of New York, records the case of a cook who, in five years, lived in four families and gave rise to twenty-eight cases; the bowel discharges furnished practically pure cultures of the typhoid bacillus, and the extrusion of bacilli in her case was shown to be intermittent. A. [11] and J. C. G. Ledingham record thirty-one cases in fourteen years at an institution in Scotland, finally traced to carrier cases.

We believe it will be found that the two instances we are about to narrate are the first recorded outbreaks in England traced to the influence of a typhoid "carrier."

(I.) OUTBREAK OF TYPHOID FEVER AT THE BRENTY CERTIFIED
INEBRIATE REFORMATORY, BRISTOL.

In November, 1906, the attention of one of us (D. S. Davies) was first called to an outbreak of typhoid fever at this institution. The general circumstances of the outbreak have been so fully detailed in a Parliamentary paper [14] that the case will now be presented as briefly as possible.

The essential facts are these. The Home contains 240 inmates and 24 resident officers; it has been opened since 1899, and typhoid fever first appeared in 1906. The water supply is good and the drainage presented no defects able to account for the occurrence or distribution of the disease. No cases of typhoid fever existed in the neighbourhood. In September, 1906, a kitchen helper developed typhoid, and in November three more cases occurred (Chart I.). These cases already suggested carriage by milk, for one was a female inmate who received an extra allowance of one pint of milk daily as she was nursing; another

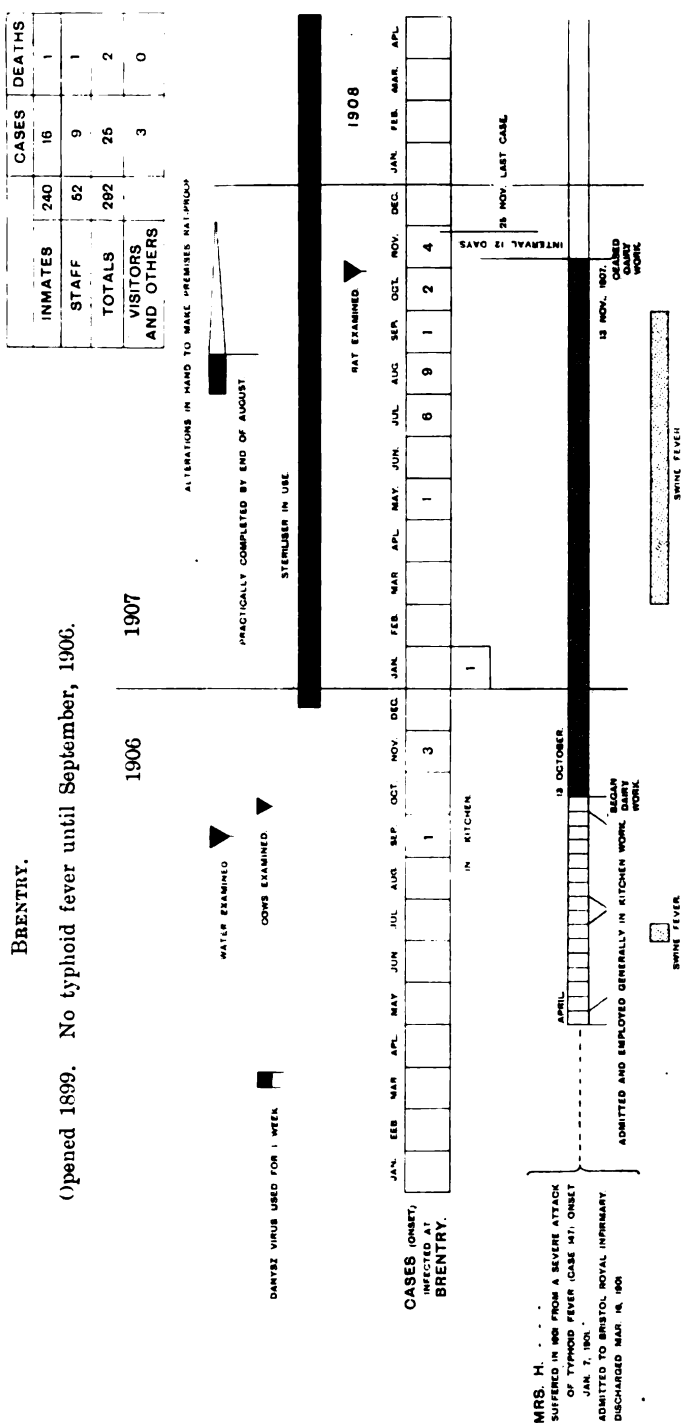


CHART I.—TYPHOID FEVER.

Intercurrent Events.—As Danysz virus had been used in March, 1906, for one week, and it was suggested that this might have some connection with the outbreak, a rat was examined, with negative results, in October, 1907. Swine fever occurred amongst the pigs at the institution in July, 1906, and again from March to September, 1907. This was dealt with under veterinary advice.

was the gardener's wife, who lived in a detached cottage on the premises and received only milk from the institution; the third was an outdoor policeman, who received an allowance of milk for his tea; but no explanation of the origin of the initial case was forthcoming. In January, 1907, the policeman's wife sickened, probably from nursing him; they lived in a cottage off the estate.

Then there was a lull until May, 1907, when fresh cases occurred, continuing through July, August, September, October and November, in small groups and at varying intervals. Already in November, 1906, the Home Office medical inspector had installed a milk steriliser, and all milk was sterilised before use and then stored in the dairy until wanted. The evidence in the 1907 cases was still stronger against the milk, which evidently had opportunity of contamination *after* sterilisation.

On the reappearance of the disease in May, 1907, the Home Office medical inspector and the medical officer of health for South Gloucestershire (Dr. Bond) made a careful examination of the premises and discovered that rats had free communication with the dairy and food stores, and it was supposed that they carried infection in from the sewers. Accordingly the food stores and dairy were made rat-proof. This was practically completed by the end of August, but still the cases dropped in steadily month by month.

The problem was at this point when I was invited by the Brentry Committee, in the autumn of 1907, to inquire into the renewal of the Brentry outbreak. I commenced this inquiry in November, 1907. Dr. Branthwaite and Dr. Bond made me fully acquainted with the results of their careful and detailed inquiries and left me a free hand. As a matter of fact, they had narrowed the issue down so closely, and had excluded so many possible sources of infection, that my task was comparatively easy.

I was at once struck by two facts. First, the obvious carriage of infection by milk; secondly, the certainty that this must become infected after sterilisation; whence followed the inference that, as rats and other possibilities had been excluded, the agent distributing infection might be a "carrier" case dealing with the milk.¹ I then learned, with the aid of the chairman of the Brentry House Committee, that an inmate employed as cook and dairymaid, Mrs. H., had suffered, in January, 1901,

¹ My attention had been especially redirected to this possibility by Savage, "Recent Work upon the Bacteriology of Typhoid Fever in its relationship to Preventive Medicine," *Public Health Lond.*, 1907. xx., p. 12.

from a severe attack of typhoid fever, from which she had apparently recovered. She is a woman aged 50, to all appearance in perfect health. She was admitted to Brentry in April, 1906, and was employed in kitchen work up to October 13, 1906, when she was entrusted also with the dairy work, which she continued up to November, 1907.

The milk, after sterilisation, is stored in the dairy, whence it is measured out for the various "villages" by means of a hand-dipper. All the milk passed through her hands. In the passage leading from kitchen to dairy is a w.c. accessible to the kitchen workers, containing a lavatory basin which was not in use. On November 13, I requested that Mrs. H. should be absolutely excluded from all kitchen and dairy work and isolated as "suspect" until I could arrange for a pathological examination of her blood, urine and stools. This was done. At the same time I ventured the opinion that, allowing for the incubation period of typhoid fever, no further case should occur. The last case occurred on November 25, twelve days after her isolation commenced; and the institution has remained free up to the present time (March, 1908).

Evidence of Milk Conveyance.—I have summarised the evidence implicating milk on Charts II. and III. Chart II. shows that of the eleven female inmates attacked, three were employed in the kitchen, two as dining-room maids and three in the tea-house, all thus having access to milk. The three other female inmates attacked were the only three who, as they were nursing, received an extra supply of one pint of milk. The baby (hand-fed) of one of these was also attacked. Three female officers were attacked, including the matron, whose illness dated from a tea party on July 31, 1907. On this occasion a visitor from a Bristol institution, where there was no typhoid, called and shared with the matron, a female officer, and the doctor's little boy a meal of which clotted cream, skimmed off the sterilised cooled milk by Mrs. H., formed part. The officer refused this, the matron and visitor, who ate some, sickened simultaneously on August 20. The little boy ate heartily but remained well. Previously to this, however, on June 20, 1907, he had developed a high temperature, which continued until June 27, and was followed by considerable depression and slow recovery; his general appearance during this attack was consistent with a masked attack of typhoid fever, although he gave a negative Widal on July 21 and on December 10.¹ If this was really a minimal attack of typhoid

¹ See *Public Health Lond.*, 1907, xix., p. 607: "Some difficulties in preventing Personal Infection in Enteric Fever," for interesting points relating to mild attacks of typhoid fever in children.

BRENTY.

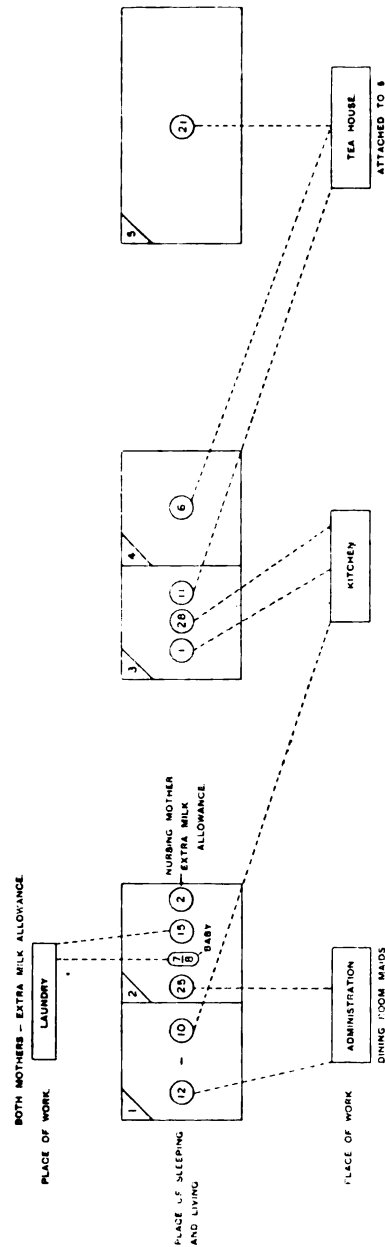


CHART II.—FEMALE INMATES. ATTACKS.

Diagram showing place distribution of attacks on female inmates.

This diagram shows the grouping of the eleven female inmates, according to their place of abode and according to their work. The grouping apparently suggests nothing as to place infection, but it is noticeable that every female inmate attacked either had an extra allowance of milk or had special access to food (including milk) in the administration (as dining room maids), in the kitchen, or in the tea house. The only persons living and sleeping in 4 and 5 who were attacked were (6) and (21), both working in the tea house. Nos. (2), (7), and (15) are the only female inmates receiving extra milk allowance, and all three were attacked.

The three female officers attacked were the Matron (19), whose attack dated from the tea party on July 31, on which date a visitor, who stayed to tea, also contracted typhoid, Miss H. (13), who slept in No. 5 and was kitchen officer, and Miss P. (27), who slept in No. 3 and worked generally in female village, serving meals, &c.

it may account for his immunity. Chart III. shows that all the four male inmates attacked were directly employed in the officers' mess-room, where they had access to milk. Cases (17) and (18) took on Case (9's) duty and sickened in turn. The three officers who lived out and were attacked all had tea-milk regularly supplied; one workman who had milk served out to him once on September 28, 1907, but denies drinking it, sickened on October 14. Of the nine officers who lived out, but received no milk, not one sickened,

Pathological Investigation.—The laboratory results obtained in the case of Mrs. H. are here summarised:—

(A) On November 18, 1907, two samples of her blood both gave the following reactions (Widal):—

Dilution		Time		Reaction
1 in 10	...	60 min.	...	Loss of motility; agglutination complete.
1 „ 25	...	„	...	Loss of motility; agglutination present, but incomplete.
1 „ 50	...	...	...	No change.

The urine yielded neither *Bacillus typhosus* nor *Bacillus coli*. The fæces yielded no organisms resembling *Bacillus typhosus*, but chiefly *Bacillus coli*. Generally the excreta appeared to be normal.

(B) On November 29, 1907, the fæces similarly yielded no organisms resembling the *Bacillus typhosus*, and were apparently normal.

(C) On December 20, as Mrs. H., after slight abdominal pain, had passed a light brown to yellow brown loose stool of uniform soft consistence, not unlike an early typhoid stool, containing no excess of mucus, blood or fat, opportunity was taken to make a third examination. Typhoid bacilli, giving all the typical reactions, were upon this occasion isolated from the fæces. The bacilli were freely motile and reacted to immune serum thus:—

Dilution		Time		Reaction
1 in 25	...	30 min.	...	Loss of motility; complete agglutination.
1 „ 200	...	„	...	„ „ „ „

The intermittence during November is noteworthy. Upon the failure to recover the *Bacillus typhosus* in November it was decided to make additional examinations of certain inmates who had more or less to do with food preparation or dairy work. Sixteen blood examinations and twelve examinations of fæces were carried out, but failed to demonstrate another “carrier.” In the fæces of the typhoid convalescents examined, the *Bacilli coli communes* exhibited many alterations from

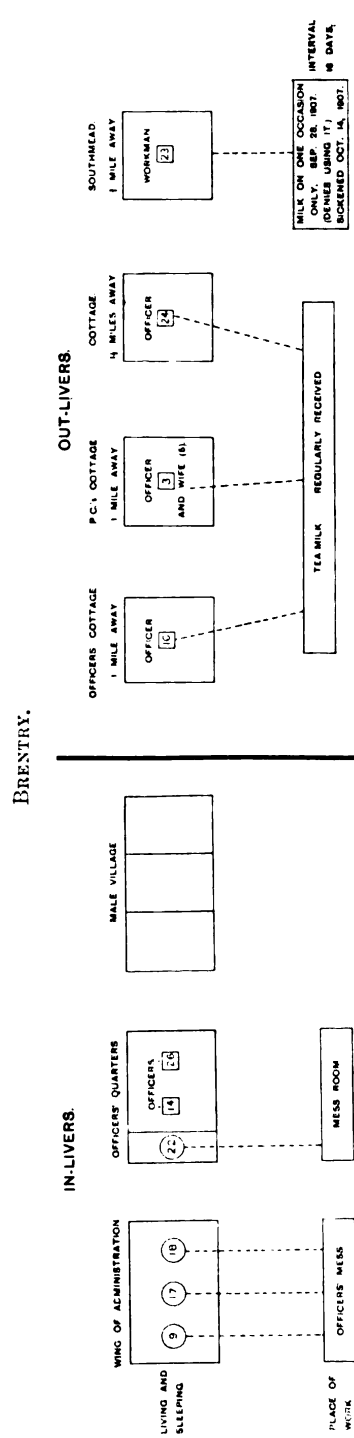


CHART III.—MALES. ATTACKS.

Diagram showing place distribution of attacks on male inmates and officers.

The inmates (9), (17), (18), and (22) were the only ones engaged in tea-making or in attendance upon officers' mess at the time of their attack. The officers living out all had tea-milk regularly supplied.

their usual reactions. They rarely were quite typical. One or more of the biological tests was always less pronounced than usual.

Methods.—The fæces were collected free from urine and placed in vegetable parchment paper and then in stoneware jars. They were conveyed to the laboratory as rapidly as possible. On arrival, ten platinum loopfuls, taken from different parts of the material, were transferred to a tube of sterile normal saline solution. After shaking, a loopful of this mixture was placed in a broth tube. From this latter tube a loopful was taken and put into a tube containing the following medium: ordinary beef broth with 0.1 per cent. sodium taurocholate and 1 in 1,500 malachite green (Grübler).

In isolating the *Bacillus typhosus* from material other than fæces, the Löffler malachite green gelatine medium has been used with successful results. With the fæces, however, the green colour soon fades, organisms other than the *Bacillus coli communis* grow well, and the plating is slow and less satisfactory. Hence the use of the present medium. Klein [9] has suggested this manner of culture for the isolation of organisms from shellfish. McWeeney (1908 meeting of the Pathological Society of Great Britain and Ireland) showed cultures obtained in a similar way, but without the addition of the bile-salt.

After twenty-four hours growth in the malachite green broth, a loopful of the culture was transferred to a second broth tube, and a series of six plates were inoculated by spreading a loopful of this culture over the surface or allowing a few drops to run over the surface. The plates were then left partially uncovered in the 37° C. incubator for half an hour, and then fully covered and inverted. As a rule five McConkey bile-agar plates and one Conradi-Drigalski plate were used for each sample. Twenty-four hours later the colourless, non-lactose colonies were examined for motility in a hanging drop preparation, and after further plating were transferred to tubes containing the following media: glucose broth, mannite broth and lactose broth. When colonies were obtained which formed acid, but did not produce gas in these media, they were further cultivated in dulcitate, saccharose and sorbite broths; and in litmus milk, neutral red agar, glucose-agar, Barsiekow's medium with glucose, and with lactose; and in peptone water for the indol reaction. The organism which gave the distinct typhoid reactions was then treated with serum from cases attacked in the present epidemic and with immune horse serum.

Danyasz Virus.—As this had been used in an attempt to kill off the rats infesting the premises, and it had been suggested that this might

have some causal relationship to the outbreak, a rat was forwarded in November, 1907, to Professor Hewlett, with negative results. Bainbridge has recently stated that Danysz's bacillus and the bacillus of mouse typhoid are practically identical. These organisms have been considered non-pathogenic for man, but an outbreak of fatal enteritis has followed the consumption of food contaminated by similar virus. Although the substance is sold publicly as harmless, it is evident that careful handling is necessary.

Swine fever broke out on two occasions, viz., in July, 1906, and from March to September, 1907. This was dealt with under veterinary advice. There is generally supposed to be no connection between human and pig typhoid, but we should have liked to make some inquiries as to the possibility of infection from "carrier" to pig, and generally into the relationship between human and pig typhoid. However, as the pigs had been destroyed before the investigation was taken up, no opportunity offered itself.

Confirmation of Causal Influence of Carrier by evidence from a Previous Outbreak.—The belief that Mrs. H. was the actual cause of the Brentry outbreak, if not proved by the foregoing sequence of events, at least provided a working hypothesis which stood the test of experiment. The necessary control experiment was found by tracing back her history to a period (1904) when she was in service at another institution, where a similar outbreak occurred.

(II.) THE OUTBREAK OF TYPHOID FEVER AT GROVE HOUSE HOME FOR GIRLS, BRISLINGTON, NEAR BRISTOL.

In 1904 this Home, opened in 1899, was occupied by thirty-six girls (aged from 5 to 15) boarded out by the Bristol Guardians and supervised by four officers. Typhoid fever first appeared in the third week of May, and from that time until the end of September, when the Home was closed, cases continued to occur in crops at intervals of a week or more (Chart IV). Twenty-five cases developed typhoid fever, eight other suspicious cases occurred, and two deaths resulted. Thus nearly all the girl inmates were attacked. How the first case arose it was found impossible at the time to ascertain; there had been no typhoid in the district for months.¹ The cases occurred in groups at intervals, many cases were very mild, the water supply from the Bristol Waterworks Company was

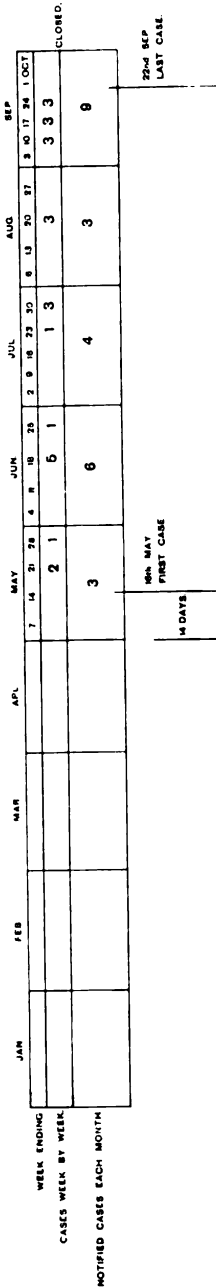
¹ Annual Report of the Medical Officer of Health (Dr. J. C. Heaven) to the Keynsham Rural District Council, Somerset, for the year 1904.

GROVE HOUSE, BRISLINGTON.

Opened February, 1899. No typhoid fever until May, 1904.

INMATES.			
	ATTACKED	DIED	SUSPICIOUS
GIRLS	38	25	2
ATTENDANTS	4	0	0

1904



MRS. H. . . .
SUFFERED IN 1899 FROM A SEVERE ATTACK
OF TYPHOID FEVER (CASE 171) ONSET
JAN. 7. 1900.
ADMITTED TO BRISTOL ROYAL INFIRMARY
DISCHARGED MAR. 18, 1901.

TRANSFERRED
FROM WORKHOUSE AS ASSISTANT IN KITCHEN
2nd FEB.
GRANTED WAGES, RATIONS AND
LOOKING AS A PAID SERVANT.
DUTIES: TO GENERALLY ASSIST IN
THE KITCHEN AND COOK.
SHE RECEIVED THE MILK FROM THE TRADESMEN,
ATTENDED TO ITS BOILING AND PREPARATION
FOR CONSUMPTION BY THE CHILDREN, AND
SERVED IT OUT TO THEM.
2nd SEP.
LEFT TO TAKE A
PRIVATE SITUATION

CHART IV.—TYPHOID FEVER.

above suspicion, there were no other cases among the dairyman's other customers, nor was the manner of the outbreak suggestive of contamination of water or milk supplies; no defects in the drains were discoverable likely to have any influence in causation. No cases occurred during 1904 in the district except at this Home. Every possible means were taken to control the disease by disinfection, boiling of milk, cleanliness, and precautions as to food, all without avail. The medical officer of health, warned by previous experience in diphtheria, shrewdly suspected a human "carrier," and the girls, *but not the staff*, were systematically examined by the Widal test. Still the outbreak went on, and did not cease until the Home was closed at the end of September and the children boarded out at various other homes. The cook left to take a private situation. This history might have been held to afford a fairly complete example of an outbreak of typhoid fever due to "insanitary" local conditions. It now appears, however, that on February 3, 1904, Mrs. H., *the same woman who was in 1906 cook and dairymaid at Brentry*, had been transferred from the Bristol Workhouse to assist at Grove House, Brislington, in the kitchen. She proved so satisfactory that on May 2 she was taken on as a paid servant, with rations and lodgings. Her duties were to generally assist in the kitchen and to cook; she received the milk from the tradesman, and attended to its boiling and preparation for consumption by the children. All the milk was kept in the kitchen.

On May 16 the first case of typhoid appeared. Cases continued through June, July, August and September. The cook left to take a private situation on September 2. The last case was notified twenty days after, on September 22, and the Home was closed at the end of September.

• *The Mechanism of Infection.*—There is apparently little doubt that the transference of infection by carrier cases may be defined as "gross," and that definite though minute amounts of infective material are conveyed into the food or milk by the hand of the carrier through carelessness and neglect to wash the hands after attending to the calls of Nature. Mittman has described in Virchow's *Archiv* [13] the finding of various micro-organisms, including bacilli, under the finger-nails of schoolboys, waitresses, cooks, and others, and the subject hardly needs elaboration, though it suggests uncomfortable thoughts anent "our daily bread." It is significant that, although the proportion of convalescents from typhoid fever who become carriers is quite substantial (Klinger gives 1·7 per cent. and Lentz 4 per cent., while Savage [15] considers these figures

too low), few, except those engaged in food preparation, achieve distinction; and that the two known outbreaks in the neighbourhood of Bristol were actually due, not to two distinct persons, but to the same cook-carrier. A. and J. C. G. Ledingham, however, found [12] that carriers not specially engaged in food work were occasionally effective.

Quiescent Periods.—The occurrence of quiescent periods, during which either no typhoid bacilli are extruded or, if extruded, fail to become effective, has been noticed by more than one observer. In this connection we may draw attention to the fact that both the Bristol outbreaks presented a period—at Brentry lasting from December to May, at Brislington from February to May—during which the carrier, although engaged in her usual occupations, proved ineffective; but from May onwards in each year the power of infection was markedly developed. What is the reason and the full import of this “close” time for typhoid carriers, which roughly corresponds to the seasonal incidence of typhoid prevalence in communities? Three examinations of Mrs. H.’s dejecta during February, 1908, have failed to disclose the presence of the *Bacillus typhosus*. We hope to continue the examination through the year, as some contribution towards a determination of the periods of intermittence in these cases. Furthermore, the importance of some indication of the resumption of infectivity, such as was afforded by the passing of a typhoid-like stool in December, 1907, is obvious.

Prophylaxis may obviously be directed to at least three points: (1) Revised criteria for determining recovery after typhoid fever and the adoption of a prescribed routine for registration of, and bacteriological control over, all convalescents; (2) meanwhile, self-defence indicates the necessity for greater care in selecting kitchen and dairy workers for home or institution. As in the eighteenth century servants were in request who had passed through the small-pox, so in the twentieth century the competence of a cook may justly include her incompetence as a “carrier”; (3) the urgency for stringent care as to hand cleanliness before commencing or resuming food preparation or dairy work is too obvious to need insistence; hand-washing drill should become a routine part of institution discipline.

Cure.—Unfortunately, the various drugs and intestinal antiseptics hitherto used have met with pronounced failure. Dehler (1907) has actually performed cholecystostomy and drainage of the gall-bladder, which seems to be followed by gradual disappearance of the bacilli, and possible cure; but, as Ledingham pertinently observes, this treatment cannot be expected to become popular. Horton Smith suggested in

1900 (op. cit.) that typhoid bacilli in small numbers may be rapidly destroyed as soon as they come in contact with the other micro-organisms in the alimentary canal, for the toxins of not a few of them are extremely inimical towards the typhoid bacillus. Can bacterial methods be looked to for a solution of the problem? Meanwhile, what is the legal status of a "carrier" capable of distributing disease and death? Are such persons "suffering" from a dangerous infectious disorder, and can they be placed under any statutory restrictions?

Addendum.—Another suggestive fact has been communicated to us by Dr. George Parker. On March 4, 1905, Mrs. H. was taken on as cook at a children's home in Clifton, where there are thirty girls. Nothing happened until May 8, when one of the girls duly developed typhoid fever, for which no reasonable cause could be found. Mrs. H. left at the end of April; no further cases occurred.

TABLE I.—SHOWING TOTAL INMATES AND STAFF, ALSO ATTACKS AND DEATHS, BRENTRY, 1906-07.

					No.	Attacked	Percentage	Died
A.—Inmates								
... Total inmates, 240					(F. 105	11	10·4	—
					(M. 135	5	3·7	1
B.—Officers, including								
indoor attendants, Resident, on full board					(F. 15	3	20·0	—
police constables, Non-resident, partial board (tea-milk)					(M. 9	2	22·2	—
and workmen engaged permanently Resident off premises, no food					M. 19	3	15·6	1
or temporarily dur- Resident off premises (workman), milk on					M. 9	—	—	—
ing the year ... one occasion only, September 28, 1907;								
sickened October 14, 1907 (denies drink-								
ing milk) ...					M. —	1	—	—
					292	25	8·5	2
C.—Others								
... Visitor (tea and cream) on one occasion								
only, tea party of July 31, 1907, sick-					F. —	1	—	—
ened August 20, 1907 ...								
Gardener's wife, lives at lodge, receives					F. —	1	—	—
milk from Institution ...								
Police constable's wife, non-resident,					F. —	1	—	—
probably contracted from husband								
					—	3	—	—

To these may be added the doctor's little boy, who developed suspicious symptoms consonant with mild typhoid on June 20 (Widal negative).

The incidence is heaviest on the male and female officers on full board (including extra milk) and next on the non-resident male officers receiving tea-milk. The incidence on the female inmates was restricted to those who helped in food preparation or received extra milk, and on the male inmates to those who helped in food preparation (messroom attendants, having access to milk).

TABLE II.—LIST OF CASES OF TYPHOID FEVER AT BRENTRY.

Case	Approximate date of sickening	Sex	Description of Patient	How employed	Source of Infection
1906					
1 N. B.	Sept. 16	F.	Inmate	Kitchen	Extra (1 pint) milk for nursing
2 A. H.	Nov. 11	F.	"	—	
3 P. C. P.	" 11	M.	Officer (cottage)	Lives out	No food but milk
City 4 Mrs. E.	" 11	F.	Gardener's wife	—	Lives in lodge, receives milk
1907					
5 Mrs. P.	Jan. 9	F.	Wife of No. 3	Lives out	Probably contracted from nursing husband
6 A. St.	May 4	F.	Inmate	Tea house	Messroom maid
7 S. Sp.	July 4	F.	"	—	Extra (1 pint) milk for nursing
8 A. Sp.	" 4	M.	Baby	—	Messroom attendant ¹
9 A. A.	" 11	M.	Inmate	Wing	
10 A. R.	" 13	F.	"	Kitchen	Messroom maid; milk stands here from 2 p.m. to 4 p.m.
11 E. L.	" 20	F.	"	Tea house	
12 G. G.	" 26	F.	"	Pantry	Attendant on officers; dining-room maid ¹
13 Miss H.	Aug. 8	F.	Officer	Kitchen	On full board
14 N. V. B.	" 8	M.	Carpenter	—	Gets board (officers' rations) ²
15 M. J.	" 10	F.	Inmate	Laundry	Extra (1 pint) milk for nursing
D. 16 R. G. M.	" 13	M.	Officer	Lives out	Receives no food but milk; died
17 C. W.	" 20	M.	Inmate	—	Messroom attendant, followed No. 9 in his duties
D. 18 H. R.	" 20	M.	"	—	Ditto, ditto; died
City 19 Miss C.	" 20	F.	Matron	—	Infected at tea party, July 31
" 20 Miss F.	" 20	F.	Visitor	—	Ditto
" 21 H. P.	" 27	F.	Inmate	Tea house	Messroom maid, followed No. 11 in duty here; milk stands here from 2 p.m. to 4 p.m.
22 W. W.	Sept. 19	M.	"	—	Attendant ¹
" 23 E. C.	Oct. 14	M.	Stoker	Lives out	Only had one meal in Institution, September 28, 1907 (denies drinking milk supplied)
" 24 L. P.	" 31	M.	Engineer	"	Has milk occasionally to use for tea
25 A. W.	Nov. 7	F.	Inmate	Pantry	Attendant on officers; dining-room maid
26 S. B.	" 9	M.	Officer	—	Indoor officer, full board
27 Miss P.	" 13	F.	"	—	Ditto
28 A. S.	" 24	F.	Inmate	Kitchen & scullery	

¹ Inmate attendants clear tables after food and have special access to food and milk.

² Inmates receive an allowance of a quarter of a pint of milk daily, which is put directly into boiling tea in a large can; only inmate attendants have access to milk. Officers receive half a pint, part of which is used cold for porridge.

Total, 28. Inmates (including baby) ... (M. 5) 16 ... (F. 11) Officers ... (M. 6) 9 ... (F. 3)

Also two officers' wives, one visitor, and (?) the doctor's little boy.

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The Potential Dangers of Water Derived from Wells in the Chalk.

By H. MEREDITH RICHARDS, M.D., and J. A. H. BRINCKER, M.B.

THOUGH water derived from wells in the chalk is for the most part of excellent quality, it is common knowledge that on several occasions epidemics of water-borne disease have been traced to such supplies. The following are outstanding instances of such epidemics in this country:—

Place	Investigated by	Persons Affected	Deaths	Source of Contamination
Caterham ...	Thorne Thorne	352	21	Contamination of headings by an ambulatory enteric patient.
Worthing ...	Thomson	1,317	168	Contamination of heading from neighbouring sewer.
Newport, I.W.	Thomson	436	42	Contamination from house drains and millpond near the well.

In all these instances it is noteworthy that specific pollution had its origin in the immediate neighbourhood of the well, and might have been prevented by care in the construction of the well and the provision of a zone of protection of quite moderate size. On the other hand, the risks of more distant pollution are not fully appreciated, and it is for this reason that we wish to put on record certain observations and experiments that we have made during the last four years. We can do this with the greater freedom because, though no epidemic has occurred, the water authority concerned has admitted the risk and taken the necessary initial steps to obviate the danger. The subject is important because there are many similarly circumstanced wells, and the great increase in the population living on the chalk outcrop must necessarily add to the risk of similar pollution.

The well is situated 318 ft. above Ordnance Datum in the Thames basin, in an area of uncovered chalk about half a mile south of a point where the chalk is overlaid by London tertiaries. The chalk escarpment is covered by varying depths of "clay with flints," as well as by a small patch of Woolwich and Reading pebble beds. The whole of the surface geology is clearly shown in the accompanying map.¹ The general flow of underground water is obviously from south to north. The following short account of the well, provided by the engineer, has been kindly checked by Mr. W. Whitaker, F.R.S. :—

				Thickness	Depth
				ft. in.	ft. in.
Earth soil, &c.	...	...	...	5 6	5 6
	Chalk, with seven layers of flints	...	...	28 6	34 0
	Hard brownish chalk rock	...	...	1 0	35 0
	Chalk, with five layers of flints	...	...	20 5	55 5
	Open bed, with flint (water first found)	...	...	3 0	58 5
	Open chalk	...	...	5 6	63 11
Flinty	Close bed and flints	...	...	2 4	66 3
Chalk	Close chalk	...	...	6 5	72 8
	Watery open flint bed	...	...	2 3	74 11
	Chalk, partly open, mostly close, partly with flints, with some layers of flint (one at the bottom, 1 ft. thick, beneath which no more was found)	...	...	77 1	152 0
	Close bed, and then plum-pudding chalk, with 3 in. of bine [marl?] at the base	...	...	5 0	157 0
Flintless	Close bed	...	...	12 0	169 0
Chalk	Curly chalk (? irregular curved jointing with two layers of bine [marl?])	...	...	31 0	200 0

All the chalk presumably belongs to the Upper division, the flintless character of the lower part being a local accident, probably of no very great horizontal extent.

The minimum yield of water from the well is nearly 1,000,000 gallons, with a maximum daily flow of nearly double that quantity.

¹ Not reproduced.

Within a quarter of a mile radius of the well there are only two cottages, both of which are supplied with earth closets carefully supervised by the water authority. As far as mere inspection can be relied upon the well is in as satisfactory a situation as can be found in the uncovered chalk, and from the time that the well was opened, in 1888, until June, 1903, the quality of the water was believed to be of uniform excellence.

Since 1897 a chemical and bacteriological examination of the water was made three or four times a year by Mr. Dibdin, whose verdict for the first six years was uniformly favourable, until we received the following report of a sample taken on June 16, 1903.¹ For comparison the report made of the same well in November 25, 1902, is also reproduced, together with a further report on a sample taken June 22, 1903.

TABLE I.

	November 25, 1902	June 16, 1903	June 22, 1903
Appearance	Clear and bright	Slightly milky	Clear and bright
Odour at 100° F.	None	None	None
Total solids, grains per gallon	23·2	21·9	22·3
Total solids, appearance on ignition	Very slight blackening	Very slight blackening	No blackening
Phosphoric acid	No trace	No trace	No trace
Hardness, total degrees	21·1	16·9	17·05
Hardness, permanent degrees	3·4	4·05	4·05
Ammonia, free, grains per gallon	Trace	0·0014	0·0008
Ammonia, albuminoid, grains per gallon	0·0005	0·0037	Trace
Chlorine, grains per gallon	0·85	0·72	0·82
Oxygen absorbed from permanganate at 80° F. in fifteen minutes, grains per gallon	0·0015	0·0219	0·0038
Oxygen absorbed from permanganate at 80° F. in four hours, grains per gallon	0·0031	0·0353	0·0102
Organic elements:—			
Carbon, parts per 100,000	0·039	0·079	0·054
Nitrogen per 100,000	0·010	0·027	0·014
Total per 100,000	0·049	0·106	0·068
Nitrogen, as nitrates, &c., grains per gallon	0·194	0·481	0·214
Cultivation on gelatine plates:—			
Colonies per cubic centimetre	10·0	3820·0	635·0
Micro-filter, millimetres per litre	—	Trace	Trace
Pathogenic organisms	Not detected	<i>B. coli communis</i> present in 100 c.c., not detected in 20 c.c.; <i>B. enteritidis sporogenes</i> present in 50 c.c.	<i>B. coli communis</i> present in 100 c.c., but not detected in 20 c.c.; <i>B. enteritidis sporogenes</i> not detected
Microscopical examination	Nothing	A clot of fibres with many free bacteria, some in zoogloea form	Fibres and vegetable débris

¹ Twenty-three samples were examined from November, 1897, to March, 1903. The number of organisms per cubic centimetre was below 100 on eighteen occasions, but reached 140, 145, 228, 276 and 366 in the remaining samples.

Consideration of the physical appearance of the water on June 16 obviously suggested that the contamination must have been massive, as a vast volume¹ of water had been rendered distinctly milky and opalescent. The chemical data, especially the diminution in the chlorine, the marked increase in albuminoid ammonia and the comparatively small increase in the free ammonia figure suggested surface water contamination rather than sewage of human or animal origin.

At the consultation which immediately followed receipt of Mr. Dibdin's report the engineer indicated a spot where it was known that surface water sank very rapidly into the chalk. This spot is marked "B" on the map,² and it is situated rather more than two miles directly south of the well and about 600 ft. above Ordnance Datum. We at once visited spot "B" indicated by the engineer and found it to be a depression situated near the southern border of that part of the gathering ground which is covered with "clay, with flints and loam." At that time the depression received the natural (surface) drainage of a considerable tract of more elevated land lying still further south. Advantage had also been taken by the architect of a large institution of the readiness with which water soaked through the overlying soil, and all the surface water drains of the institution, and of the adjacent road, were led to the same spot. In spite of the large accession of water reaching the depression in times of heavy rain, it was noticed that water rarely produced any pooling, but passed through the soil as rapidly as it reached the depression. On inquiry from the "oldest inhabitant" we were told that some fifty years ago there used to be a pond where the depression is now found, and that on one occasion the pond disappeared with a rushing noise, leaving a hole of some depth, which was subsequently filled in with soil. For this we have no other evidence than tradition, but in January, 1899, four holes, measuring from 6 ft. to 20 ft. across, suddenly appeared in the chalk at a point marked "C" on the map.³ Three of these holes have since been filled up, but the fourth is still visible. There is, therefore, evidence that the chalk in this particular neighbourhood is subject to accidents of the kind indicated. Furthermore the depression "B" is situated near the top of one of the valleys, which ultimately opens out near the well. As underground streams tend to run in valleys, it did not seem improbable that water flowing into depression "B"

¹ The well and adits have a storage capacity of over 500,000 gallons.

² Not reproduced.

³ Not reproduced.

might reach a more or less defined channel and thus take a comparatively short cut to the well. In order to verify this hypothesis the following experiments were made:—

On June 21, 1903, at 7 a.m., $1\frac{1}{2}$ tons of salt were placed in the depression, and a similar quantity in a neighbouring part of the field, where the soil also seemed to allow of free percolation. About 40,000 gallons of water from the public supply was then pumped on to the salt. At the same time the pumps in the well were run day and night at their maximum capacity, so as to favour the flow of water towards the well and lower the water-level until the headings could be explored. In the meantime samples of the well water were analysed half hourly for chlorine. The first fifty-eight samples gave the following results—fifty-one gave exactly 1·2 parts per 100,000, two gave 1·1 parts, and five gave 1·3 parts. The fifty-ninth sample, taken twenty-nine hours and a half after the beginning of the experiment, showed 1·3 parts per 100,000, and from that time until seventy-five hours after the addition of the salt did not again show as low a figure as 1·2 parts. The highest figure reached was 1·6 parts, found at the thirty-eighth and forty-first hour of the experiment.

As we wished to confirm these results a further quantity of $1\frac{1}{2}$ tons of salt was washed into the depression at 6 p.m. on June 23. This resulted in a further rise in the sodium chloride figures, as much as 1·7 parts per 100,000 being found twenty-two and a half hours after the salt had been washed down the depression. On this occasion the variations in the sodium chloride figures were somewhat more erratic than during the first experiment. This may partly be accounted for by the fact that we were unable to wait until the sodium chloride figure returned to normal, and partly to the prolonged pumping having produced an unusually large cone of depression. In both experiments it was found that the most definite results were obtained about twenty-nine hours after the addition of salt to the depression. At the same time opportunity was afforded for examining the headings, and samples were taken of the chief springs. These were examined for chlorides, but we had no opportunity of making a complete analysis. The figures are, however, interesting:—

					The amount of chlorine in parts per 100,000
The well under normal condition	...	...	...	...	1·2
The well on June 25, 12.30 p.m.	...	...	...	...	1·4
Main spring	...	...	...	...	1·4
Small spring	...	...	...	...	1·2
Branch heading	...	...	...	...	1·3
Branch heading with holes	...	...	...	...	1·4
Subsidiary headings	...	...	...	...	1·2

It will be noticed that only certain of the fissures yielded water with an excess of chlorides, but unfortunately these included the springs furnishing the bulk of the water to the well. While taking these samples we made a note of the physical condition of the well and its adits. The shaft itself was remarkably dry and presented no evidence of surface water finding its way behind the lining of the well. The most striking feature was the projection from numerous minute fissures in the headings of brown jelly-like masses of finely divided clay. Obviously the constant flow towards the well had washed this clay from the surface through the huge mass of super-jacent chalk.

In the meantime a complete inspection was made of the physiography of the gathering ground and a house to house inspection of all the premises situated within one mile of the well. The results of this inspection need not be given in detail, but briefly amounted to this. No other spot could be discovered where surface water was likely to enter the chalk in large volumes, nor could any cesspool be found so situated as to suggest risk of intermittent pollution of the well. Inquiry was also made of the engineer in charge of the pumping station as to whether he had previously noticed any similar opalescence of the water in the well. We found that he had done so and noted the fact in his diary, though the turbidity was never as marked as on this occasion and had always been ascribed to the breaking down or opening up of fissures. On examining the diary from June, 1897, onwards we found that the water had been noticed to be cloudy once in 1898, 1899 and 1901, and twice in 1900. The exact dates of these observations, together with others made from June, 1903, to June 30, 1907, are given in the following table. To this we have added some particulars as to the rainfall on the days immediately preceding the observations (*see Table II.*).

It will be seen that from June, 1897, to June, 1907, there were seventeen occasions on which the physical appearance of the water was noticed to be abnormal. It is a striking fact that excessive rainfall was measured twenty-four to forty-eight hours before the opacity was noticed on fourteen out of the seventeen occasions. Whether the cloudiness noted on December 28, 1900, and November 5, 1904, was accompanied by bacteriological pollution is unknown, as unfortunately no samples were examined on these occasions. It may be that the cloudiness was simply due to the flow of water breaking down some of the masses of finely divided clay which project from the fissures into the adits. In any case

the effect of excessive rain is undoubted, and on three occasions we have forecasted the pollution of the well by watching the rain gauge. On one of these occasions the total bacterial count was only raised to sixty, but *Bacillus coli* was found in 1 c.c. of the water, though *Bacillus coli* was absent from 100 c.c. of water from an adjacent well not subject to this intermittent pollution. Again on examining the bacterial count previous to June, 1903, there were five occasions on which more than 100 organisms per cubic centimetre were found. On four out of the five occasions excessive rainfall had preceded the submission of the samples to the analyst. Unfortunately the data in our possession do not enable us to

TABLE II.

ENGINEER'S NOTES			Rainfall observed at well.
Year	Month	Appearance of water in 9 ft. tank.	
1898	December 8	Very thick	0.74 on December 6, 1898
1899	January 13 and 14	Little cloudy	0.67 on January 12, 1899
1900	February 17	Thick	0.96 on February 15, 1900
1900	December 28	Cloudy	No excessive rain; 0.32 on December 26
1901	December 13	..	1.53 on December 12, 1901
1903	June 12	Very cloudy for 14 days	1.67 on June 10, 1903
			0.87 on June 11, 1903
1903	October 28	Cloudy	1.20 on October 26, 1903
1903	November 30	A little cloudy	1.63 on October 27, 1903
1904	January 31	Cloudy	0.98 on January 30, 1904
1904	February 14	..	0.70 on February 12, 1904
1904	July 25	A little cloudy	0.57 on July 25, 1904
1904	November 5	..	No rain
1905	November 13	..	0.7 on November 11, 1905
1906	January 7	Slightly cloudy	0.55 on January 5, 1906
1906	January 17 to 20	Thick	1.05 on January 16, 1906
1906	February 18 and 19	Cloudy	0.33 on February 16 and 0.46 on February 17, 1906
1906	November 8	Discoloured	0.73 on November 6, 1906

state with accuracy the exact relation between the rainfall and pollution of the well, but we are now accustomed to look for evidence of pollution when the fall of rain on the gathering ground approaches 1 in. in twenty-four hours. To reach more accurate conclusions would require much more frequent analyses to be made of the well water and more complete observations of the rainfall. Hitherto we have had to depend on a gauge situated at the well itself, and we have no record before 1907 of the amount of rain falling near the point "B."¹ Further observation

¹ A gauge is now fixed near the depression.

will doubtless show that the effect of rainfall on the well depends not only on the amount observed but on the previous condition of the soil and the speed with which the water is able to reach the depression.

So far our experiments only showed that soluble matter found its way from the depression "B" to the well in about thirty to thirty-six hours. As this time corresponded with the interval usually observed to elapse between heavy rainfall and visible pollution of the well the experiments with salt furnished valuable corroboration of our hypothesis. Indeed, it was this coincidence in time and the shortness of the interval itself that were most striking. The mere discovery in well water of soluble salts or of colouring matter washed into the depression on the gathering ground is not in itself necessarily indicative of risk of pollution, though experiments with sodium chloride, lithia or fluoresceine are often of service, in as far as they suggest sources of pollution and demonstrate the direction taken by underground streams. Obviously such experiments cannot prove the possibility of particulate matter following the same course. We therefore determined to ascertain whether it would be possible to recover from the well, known bacteria previously added to the depression "B." For this purpose we intended using cultures of *Bacillus prodigiosus*, but Dr. Houston, who was good enough to discuss with us the details of the proposed experiment, suggested that it would be more convenient to use one of the non-pathogenic chromogenic organisms normally found in river water, which for convenience we shall refer to as the "test microbe." Of this bacillus Dr. Houston kindly supplied an active, pure culture. The test microbe ferments sugar media; hence if the primary sugar media inoculated with the well water showed no gas formation, its absence could be inferred with certainty. Furthermore, if gas production occurred in the primary media it could (owing to its being chromogenic and having special sugar reactions) be differentiated readily from other gas-forming microbes (*e.g.*, *Bacillus coli* and allied forms).

Before proceeding further one of us (J. A. H. Brincker) worked through the biochemical properties of the organism and also proved its absence from the well water. A note of the reactions is appended.

EXPERIMENT III.

We next prepared six Winchester quarts of sterilised peptone water, inoculated them with the test organism, and kept them in a warm place (about 25° C.) for a week, when a copious growth was obtained. On

April 24, 1907, at 6.30 a.m. to 9.20 a.m., the contents of these bottles were emptied into the depression "B" and washed into the soil with some 60,000 gallons of water. Samples of water were taken from the rising main of the well at 7 a.m., noon, and 6 p.m. each day. These samples were carefully collected in sterilised bottles, and packed in ice until examined.

(I.) One cubic centimetre of water was inoculated into a gelatine plate and incubated for three days at 20° C.; the bacterial content was then ascertained, and any organisms suspicious of being either the *Bacillus coli* or the test microbe isolated and grown in broth. From the broth culture gelatine plates were inoculated, and the biochemical properties of the organism studied by its action on various media.

(II.) Various quantities of water¹ (15 c.c., 10 c.c., 5 c.c., 1 c.c., and $\frac{1}{10}$ c.c.) were inoculated into bile-salt glucose broth and incubated at 37° C. for three days. These tubes, as soon as they showed signs of acidity or gas, or both, were removed, and subcultures made as follow :—

(1) (a) Gelatine plates. (b) Into media mentioned in Table V.

(2) Any suspicious colonies isolated from the gelatine plate were treated as was done in (I.) above.

The results are given in Table III. and Diagram B.

The results of this experiment are as follow :—

(1) The particulate matter introduced into the soil at "B" was detected in the water of well "A" 78·5 hours afterwards.

(2) Its appearance in the well water was associated with a marked rise in the bacterial content of the water.

(3) *Bacillus coli*, though present in 10 c.c. and 5 c.c. in the first two samples taken, was absent from the next five samples, but made its reappearance in the well water at about the time when the obvious pollution was obtained; it could then be detected in 1 c.c. of the water. The conclusions are that this pollution of the well water must have come from the surface soil of the depression "B," two miles away. Unfortunately the experiment was stopped at the end of 78·5 hours, and the organism was only found in the last sample of the water.

¹ In Experiment III. the largest quantity of water used was only 10 c.c., but in Experiment IV. the quantity was increased to 15 c.c.

EXPERIMENT IV.

Some months were allowed to elapse in order to allow the well to purify itself of this micro-organism. By July 24 it was found that the micro-organism used in the previous experiment had entirely disappeared. To obtain a more pronounced result twelve Winchester quarts of the organism in peptone water were prepared and arrangements made to carry the experiment on for a week. The micro-organism was washed into the soil of the swallow from 12 noon till 4.30 p.m. of July 24, 1907, by about 81,000 gallons of well water. Eight-hourly samples of water from the well were examined as in the first experiment. The results are embodied in Table IV. and Diagram B. From these we learn that:—

(1) This test organism was absent from all samples of water until sixty-seven and a half hours after the swallow was infected. This is a shorter interval than was observed on the previous occasion.

(2) The presence in the well water of this organism was accompanied by a marked increase in its bacterial content, together with the presence of *Bacillus coli* (Flaginac).

(3) The maximum pollution from “B” seems to have been attained about seventy-eight hours after infection. Thereafter the pollution, as indicated by the bacterial count, gradually diminished, but persisted for at least 168 hours after infection.

GENERAL CONCLUSIONS.

The time at our disposal will not allow of adequate discussion of the numerous problems arising out of the foregoing experiments, but we make the following suggestions:—

(1) That wells in the chalk require to be safeguarded not only by an adequate zone of protection, but by careful inspection of the gathering ground to discover the presence of swallow holes or other weak spots in the chalk.

(2) That danger is most likely to arise when the chalk is *partially* covered by an impervious stratum, so that the surface water tends to be concentrated at a few spots instead of passing equally into the chalk outcrop.

(3) The necessity of frequent bacteriological examination of chalk water even when the wells are apparently above suspicion.

(4) The necessity of providing some purification scheme if the water be bacteriologically or chemically unstable, or if inspection or experiment reveal any substantial risk. Whether the purification scheme should be sand filtration, softening, ozonization, or a combination of these processes, we must leave for future discussion.

Lastly, we wish to express our thanks to Dr. Houston for suggesting such a convenient test microbe and for the information he was good enough to place at our disposal.

TABLE III.—EXPERIMENT III. WITH YELLOW BACILLUS, APRIL 24 TO 27, 1907
(DR. HOUSTON).

No. of sample	Day, date, and hour	No. of hours elapsed since depression B was infected	DETERMINATION OF BACILLUS COLI = B.C. YELLOW BACILLUS = B.Y. } IN				Total No. of organisms per 1 c.c. water	Remarks
				10 c.c.	5 c.c.	1 c.c.	0.1 c.c.	
	1907							
1	Wed., April 24 Noon	5.5	B.C. B.Y.	+	—	—	—	12
2	Thurs., April 25 7 a.m.	24.5	B.C. B.Y.	+	+	—	—	15
3	„ Noon	29.5	B.C. B.Y.	—	—	—	—	11
4	„ 6 p.m.	35.5	B.C. B.Y.	—	—	—	—	11
5	Friday, April 26 7 a.m.	48.5	B.C. B.Y.	—	—	—	—	14
6	„ Noon	53.5	B.C. B.Y.	—	—	—	—	10
7	„ 6 p.m.	59.5	B.C. B.Y.	—	—	—	—	15
8	Sat., April 27 7 a.m.	72.5	B.C. B.Y.	+	—	—	—	19
9	„ 1 p.m.	78.5	B.C. B.Y.	+	+	+	—	157 Typical yellow colonies and <i>Bacillus coli</i> obtained in this sample

Note.—In Experiment III. the largest quantity of water used for bacteriological analysis was 10 c.c. This was increased to 15 c.c. in Experiment IV.

TABLE IV.—EXPERIMENT IV. WITH YELLOW BACILLUS, JULY 24 TO 31, 1907
(DR. HOUSTON).

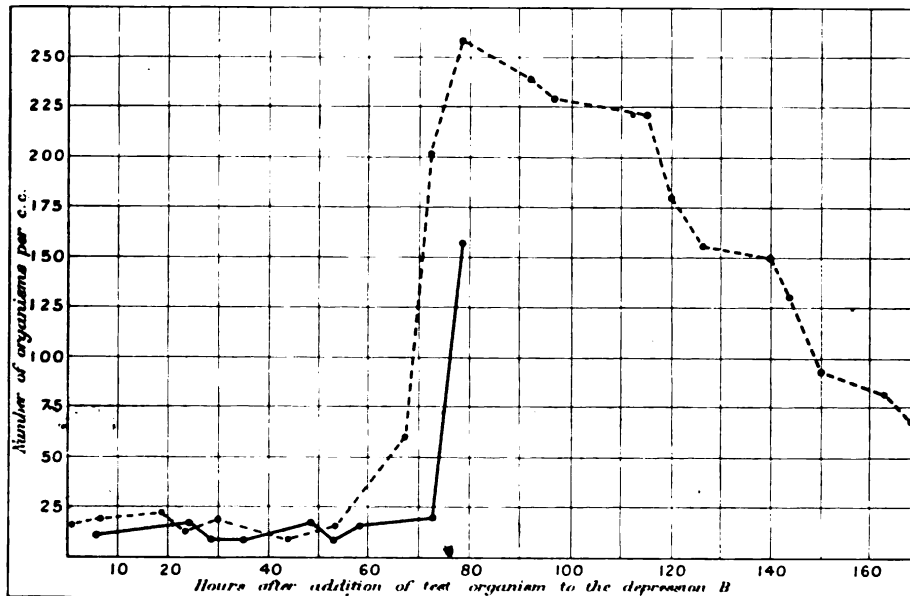
No. of sample	Day, date, and hour	No. of hours elapsed since depression B was infected	DETERMINATION OF BACILLUS COLI = B.C. YELLOW BACILLUS = B.Y. } IN					Total No. of organisms per 1 c.c. water	Remarks	
				15 c.c.	10 c.c.	5 c.c.	1 c.c.			0.1 c.c.
1	1907 Wed., July 24	Prelim.	B.C.	—	—	—	—	—	21	Plate liquefied in two days First indication of contamination <

¹ Number of organisms here calculated to find place on curve.

TABLE V.—DIAGRAM B., SHOWING BACTERIAL COUNT OF SAMPLES OF WATER.

— Experiment III., April 24 to 27, 1907.

---- Experiment IV., July 24 to 31, 1907.



The micro-organism used in these experiments shows the following characteristics:—

- (1) Microscopically: A small motile bacillus very much like the *Bacillus coli communis*.
 - (2) On gelatine plates: The colonies are observed as small white or slightly coloured spots at the end of forty-eight hours. In four days the surface colonies are large, heaped up, and of a brilliant orange colour. In six to seven days they begin to liquefy. It gives the following reactions:—
 - (3) Acid and gas formation in the following sugar media: dextrose, galactose, levulose, lactose, maltose, mannite, sucrose.
- Note:* The action on lactose is very slow; after forty-eight hours at 37° C. there is only very slight production acidity and gas, differing, therefore, very markedly from *Bacillus coli communis*.
- (4) Acid and firm clot in litmus milk culture.
 - (5) Reduces nitrates to nitrites.
 - (6) No indol formation.
 - (7) Fluorescence in neutral red broth cultures.
 - (8) No reaction on dulcitol.
 - (9) Ferments bile salt broth, producing acid and gas.
 - (10) Tendency to lose the power of producing pigment when subcultured, but regains this power with rejuvenescence in broth at low temperatures.

The Relation of the *Bacillus typhosus* to Typhoid Fever.

By W. H. HAMER, M.D.

A MARKED change of mental attitude towards the problems of typhoid fever has been brought about by recent bacteriological work, which has led, *inter alia*, to adoption by many of the view that "the causal organisms multiply only within the human body and cannot carry on a saprophytic existence outside it."¹ It is urged by those who think thus that exaggerated importance has been attached in the past to water, milk and food as vehicles of infection, and it is claimed that attention should be more perseveringly directed to the question of "contact infection."

When it was realised that the excretions of persons attacked by typhoid often contain for weeks, and it may be for months—it is said, in exceptional instances, even for thirty or forty years—vast numbers of bacilli, it was at once declared that this must mean mischief, and evidence of harm so caused was looked for, first in one and then in another direction. As it was found that little or nothing came of the search, one theory after another was propounded to explain this want of success, and new branches of inquiry were successively exploited. Thus one of the first points to receive attention, when infectivity from person to person is in question, is whether there is a special incidence upon particular houses.² Then secondly, in the absence of obvious "contact infection," there still remains the possibility that the disease may be spread by apparently healthy persons, the fire thus smouldering unrecognised. In the light of Koch's observations regarding malaria, children naturally fell under suspicion, and it was conjectured that, in particular areas, it would be found the native-born adult had been already rendered immune, while newcomers more especially suffered. Suggestions of this sort prompted inquiry into conditions obtaining in endemic areas of prevalence, both as to the immunity of particular

¹ Vorwort. *Arch. a. d. kaiserl. Gesund.*, 1906, xxiv., p. 1.

² It should be noted that, even if the existence of typhoid houses were demonstrated, it would not necessarily follow that personal infection afforded the only possible explanation of such occurrence.

sections of the population and as to the ability of apparently healthy individuals to spread infection. Thus Frosch (Koch's *Festschrift*) observes that certain epidemiological problems necessarily now come to the front, and, as he says, they cannot be settled in the clinic or the laboratory. He mentions "typhoid houses" and "regional immunity." Quite recently Klinger¹ has emphasised the importance of the "chronic bacillus-carrier," and he notes that, for solution of the problems which arise in this connection, we are, since pathogenicity for the guinea-pig does not necessarily imply pathogenicity for man, "unfortunately compelled to fall back upon epidemiological observations." There is, then, an appeal to the observer in the field with regard to these three questions.

(1) *Typhoid Houses*.—Some writers² go so far as to refer cases for which no other etiology can be discovered to earlier cases in the same house or in a neighbouring house, and this after an interval of years; Frosch (1907) describes "Die Wanderung des Typhus eine Strasse entlang von Haus zu Haus." The facts recorded by von Dönitz, in Berlin (1903), are more in accord with those ascertained in this country. Niven insisted ten years ago, in this connection, upon the need of determining whether an observed incidence is any more remarkable than mere chance will explain, and when this test is applied the case for "typhoid houses" breaks down, just as that for "cancer houses" (Behla) has been found to do by Symons and others.³

A particular instance of employment of the house incidence test in typhoid fever may, however, be mentioned, as the outbreak presents special points of interest. It occurred in Beuthen, in Upper Silesia,⁴ and there were two waves of disease; the first prevalence reached its height in May, the second at the end of July. Contact infection is said to have been responsible for the double outbreak, and this is held to be proved by the occurrence of a large number of secondary cases in houses. The report is a full one; it is open to the criticism that no attempt is made to separate primary from secondary cases, but this, it may be said, is a *petitio principii*. At least it may be urged, however, that the early and later cases in Beuthen occur in a way which suggests that the

¹ *Arb. a. d. kaiserl. Gesund.*, 1906, xxiv., p. 35.

² Richter, *Zeit. f. Medizinal-beamte*, 1904.

³ In an interesting study of the house incidence of *phthisis* in Posen, by Wernicke (Koch's *Festschrift*), the point is made that, in certain streets, some houses suffer severely while many escape altogether. There is, however, no reference to the *a priori* probability of occurrence of the phenomena observed. If the numbers of susceptible persons, in the houses in question, may be assumed to have varied within the usual wide limits, I find that chance, and chance alone, would explain the results exhibited by the Posen figures.

⁴ *Zeit. f. Hyg.*, 1901.

separation should have been made.¹ The report is open to the further criticism that, arithmetically considered, the later incidence upon houses originally invaded is no more remarkable than chance would explain. The houses, we are told, are massive, two or three storeys high, and each contains four to ten families. The inhabitants of any one house thus constitute a not inconsiderable fraction of the total population at risk. The probability of occurrence, as a mere coincidence, of later cases in houses already attacked is therefore appreciable, and as no regard is paid in the report to this fact, the argument is vitiated.

Particularly noteworthy, in connection with study of "contact infection," is the explanation given of the double prevalence. We are told how, in the May outbreak, step by step a contact epidemic was built up; the authorities, it appears, were then stimulated to undertake energetic measures (of isolation and disinfection), with the result that slackening followed in June. Surely, however, the report says, contact infection in the dwelling again comes into operation; . . . numerous convalescents, too, are discharged from hospital, pressure upon accommodation leads to early return of cases to their homes, and these spread abroad contagion in the disinfected houses. Now, too, those affected in the first outbreak and not removed to hospital again begin to mix with their fellows . . . and so on.

It is perhaps unnecessary to pursue the "house incidence question" further, as during the last few years it has been practically abandoned in favour of more novel lines of investigation.

(2) *Regional Immunity*.—On turning now to the study of the smouldering of typhoid in particular communities, or in sections of the population, a most instructive case is that presented by Conradi.² This observer had published an earlier paper on dysentery in and near Metz, giving an account of an outbreak of 70 cases, in which not one single native-born inhabitant more than 22 years old was attacked, while twenty-five strangers, whose ages exceeded 25 years, suffered.³ The numbers, it will be felt, are too small to found conclusions upon, but the

¹ Examination, for example, of Barry's (Tees Valley, 1890-91) figures show that the percentage of later or secondary attacks in houses to total attacks rose from quite a small to quite a large percentage as the outbreak developed (3 per cent. in the first, to 35 per cent. in the sixth fortnight). The Beuthen investigator draws no distinction between earlier and later stages of prevalence; indeed, when he shows that second cases in houses are common, he takes periods subsequent to those of development of the outbreaks. He would, of course, have obtained results such as those he exhibits by treating in a similar way figures relating to almost any food or water epidemic.

² *Arch. a. d. kaiserl. Gesund.*, Berl., 1906, xxiv., p. 97.

³ The main group of cases occurred in the Hauptstrasse of Moulins, where there were six cases in one house, four in each of two others, and so on. Clearly generalisations from such figures are unwarranted. Moreover, it appears (see Koch's *Festschrift*) that there was "avoidance of medical treatment" and "concealment of cases." May not this "avoidance" and "concealment" have been especially manifested by Metz-born adults? Again, it transpires that six native-born persons, whose ages ranged from 16 to 22, were attacked.

experience is interesting as it no doubt led to the main inquiry to be now referred to. Conradi's thesis is that typhoid has prevailed from time immemorial in Metz, and that it ever smoulders, mainly among the babies and young children of the town, the native population at higher ages being thus rendered immune. The disease spreads, however, to newcomers and hence to the soldiers; this especially occurs during campaigns; it did so very notably at the time of the siege of 1870, when upwards of 30,000 cases occurred in Metz and its near neighbourhood; but the mischief continually operates and interferes, year in and year out, with military efficiency.

The thesis is supported by a comparison of certain percentages, of total deaths and of typhoid deaths, contributed by native-born persons.

Figures are given showing deaths at age-periods (1880 to 1904). There were, it transpires, 382 deaths from typhoid among immigrants (173 among soldiers, 209 among civilians), and only 45 among the native-born population. Unfortunately the proportions of these two classes of the inhabitants cannot be stated.¹

Conradi, however, calls particular attention to the fact that up to 15 years of age natives and immigrants suffered from typhoid to something like an equal extent; but over 25 there were only four natives as contrasted with 119 immigrants. He says it may be suggested that this striking difference finds explanation in the fact that, following upon the events of 1870, the native-born element in Metz underwent an enormous diminution; but he disposes, as he believes, of this suggestion by giving figures from which he estimates the proportions of natives and immigrants respectively among the older people now living in Metz. At ages over 30 there were, in 1890, 409 deaths, from all causes, among immigrants and 120 among native-born persons. The argument thus assumes this form:—

At ages over 30, in 1890, 22 per cent. of the total deaths occurred among native-born persons. At ages over 25, taking a period of twenty-five years (1880 to 1904), only 3 per cent. of the typhoid deaths occurred among native-born persons. Hence, &c. Obviously these percentages should not be compared with one another; the first is based on a single year, and that, it appears, was an exceptional one; further, a rate in 1890 is not comparable with an average rate taken over the period 1880 to 1904, having in view the admitted remarkable changes of population in Metz. But the most important point is that, of the 120 deaths of Metz-born persons over 30 years old (upon which the first percentage is based), no fewer than 79 occurred at over 60, and actually 99 at over 50 years of age.

Clearly the extent to which Metz-born persons are included among

¹ In 1895, however, out of 45,480 persons, only 16,484 were native-born; 28,996 were civilian immigrants, to whom must be added 16,776 soldiers, making 45,772 total immigrants.

those dying at advanced ages is not much to the point. We have to deal, if the comparison of percentages is to be precisely made, with the typhoid ages. We cannot obtain from Conradi's tables the percentage of native-born persons attacked at the ages of special typhoid incidence, but it must be considerably less than the percentage (14 per cent.) at the ages 30 to 50. From the rates given in the tables we may conclude with some degree of certainty that there were not, in 1903, more than 4,000 or 5,000 Metz-born persons in Metz at ages exceeding 20 years, and on this basis there cannot have been at the ages 20 to 45 more than one Metz-born to some ten or twelve non-Metz-born persons. This fairly corresponds with the proportion of Metz-born to non-Metz-born persons among those attacked by typhoid at those ages in 1903. (The figures are given in Table V.¹) Thus the supposed immunity of native-born persons proves to result from a mere trick of the figures; and as the native-born persons at the ages in question are in actual fact an insignificant minority, there is no need to assume that their failure to appear in larger numbers, in mortality returns relating to typhoid, can only be explained by adopting the hypothesis that they are immune to that disease.

It is especially deserving of note that the garrison, consisting of men at susceptible ages, and constituting more than one-quarter of the total population of Metz, is entirely immigrant—the Metz-born lads as they reach the age of military service are apparently removed from the town. Moreover, the special influence of the year 1870 needs to be considered. The tables given by Conradi supply evidence that few Metz-born babies and children remained in Metz after the siege; hence it is no matter for surprise that typhoid mortality figures relating to 1880 to 1904, *i.e.*, to a period from some years after to upwards of thirty years after the war, yield scanty evidence of the presence in Metz of native-born persons between 15 and 35 years of age.

Another interesting contribution to the "regional immunity" question is that of Frosch.² The paper has been much quoted in Germany, but the figures are too small to carry weight. In a population (of apparently 400 to 500 persons) occupying sixty-six houses, in Wittlich, a town of 3,600 inhabitants, a water-borne epidemic of typhoid occurred in 1895. Subsequently (1896 to 1903) further cases occurred in Wittlich, and in

¹ This correspondence is observed on comparing an estimated population in 1903 with cases in that year. Comparison of total deaths in a number of years with the deaths or population of a particular year is, as already remarked, open to obvious objections.

² Koch's *Festschrift*, 1904.

the town generally new arrivals and natives of the place were indifferently attacked; in the special area of the water epidemic no natives suffered, but "several cases" occurred among strangers. According to the case-rates obtaining in Wittlich, only three or four cases would, on the law of chance, have to be allotted, for the period 1896 to 1903, to the special area. The fact that no native of the area was attacked does not, of course, under these circumstances, furnish material upon which to generalise.

Conradi has made an elaborate study¹ of this question of "regional immunity" in Ottweiler. This town (5,028 inhabitants) suffered from an extensive outbreak of typhoid (353 cases) in 1891 to 1892. Conradi finds that 75 further cases occurred, during the succeeding fourteen years, *in natives who were, at the time of the outbreak of 1891 to 1892, living in the epidemic area, and had since continued to do so.* Clearly, as Conradi says, more evidence is required before the doctrine of regional immunity can find general acceptance.

(3) *Chronic Carriers*.—Study of chronic bacillus carriers, however, has brought new problems to the front. If persons who have undergone attack by typhoid be examined after a short interval of time, 3 per cent. or 4 per cent. are found to have typhoid bacilli in their excretions. When this was first demonstrated it was assumed that all difficulties with regard to the origin of cases of the disease were at an end. The facts did not, however, fit into their places in the way anticipated. Thus, in the first place, there is apt to be trouble as regards discovering chronic carriers under circumstances in which they might be expected to be found. Brummund² could not detect one carrier among 160 persons examined two or three years after attack, and he says: "Es ein besonders glücklicher Zufall ist bei einem chronischen Typhusträger bazillushaltigen Stuhl zu bekommen." Kayser, too, has pointed out the remarkable intermittency of appearance of the bacilli ("exquisit schubweisen Darmentleerung"). Again, when chronic carriers are actually kept under observation, no contact cases (Klinger) are found to occur, but this is, perhaps not unnaturally, explained as being due to the fact that proper precautions are taken.³

¹ "Klin. Jahrb.," Bd. xvii., H. 2.

² *Zeit. f. Hyg.*, Leipz., 1907, lvi., p. 425.

³ Dr. Geo. Dean (*Brit. Med. Journ.*, 1908, i., p. 562) has recorded a case of a carrier of twenty-nine years standing from whom, so far as is known, no case has originated. Kirchner ("Klin. Jahrb.," Bd. xvi.) has shown that when a cholera epidemic is declining the primary bacillus carriers increase in numbers. Conradi thinks that in typhoid, too, the appearance of carriers indicates loss of virulence of the organism. In point of fact, the practical outcome of this teaching appears to be that in a multitude of bacillus carriers there is safety.

A curious explanation of this absence of contact cases is given by Brummund. The outbreak recently investigated by him at Mulsum was caused by milk, and among those who did not consume the infected supply there were no contact cases. Brummund points out that the inhabitants of the place were divided into two hostile camps, according to their source of milk supply. "Die Mulsumer gewissermassen in zwei feindliche Heerlager mit dem Devisen; hie Mulsumer, hie Kutenholzer Molkerei, gespalten sind, die sich grimmig befehlen und jedenfalls allen freundschaftlichen Verkehr miteinander vermeiden." In the schools, it is true, the children drinking one supply sat side by side with those drinking the other supply, but here, we are told, the insistence of the school teacher upon the risk of infection impressed the scholars and led to proper precautions being taken.

The need for reconsideration of the whole position, in the light of the facts ascertained with regard to "carriers," is urged by Conradi.¹ He now contends that typhoid is especially infective quite early in the disease, even in the incubation period. Bacillus carriers, he says, are of three kinds (primary, secondary and tertiary), and only the last kind really constitutes a source of danger, and that only under exceptional circumstances. Contact infections arise, as his detailed examinations show, within the first or second weeks of illness of the original cases; late contact cases rarely occur. Sporadic cases, however careful the investigation made, cannot, as a rule, be traced to previous cases, and these sporadic cases, even in the absence of isolation, disinfection, &c., do not give rise to secondary cases. He asks: "Why are outbreaks thus limited to single cases, which again on their part give rise to no further infection?" Too much reliance must not be placed, he adds, in linking up cases of infection, upon the healthy "carrier." "It is difficult to prove that he is infectious, as we discover him only because of the fact that he lives in infected surroundings. *Post hoc ergo propter hoc*." Having carefully watched bacillus carriers, he finds they are not, as a rule, infective; nothing is known concerning the virulence of the organisms they excrete, and he concludes that it can only be under exceptional circumstances that they are a source of risk.

In striking contrast to this attitude stands that of Kayser, who has from the first claimed that the rôle of the chronic "carrier" is an extremely important one. In 1906 he wrote his "Milch und Typhusbazillenträger," and in the same year, in his "Gefährlichkeit von Typhusbazillenträgern," he recounted the case of the Bäckermeisterin, who ten years previously had typhoid, and whose young assistants, year after year, suffered from gastro-intestinal disorders, until at length, upon

¹ "Ueber die Kontagiosität des Typhus," "Klin. Jahrb.," Bd. xvii., H. 2.

one of them developing typhoid, the Bäckermeisterin herself came under suspicion, and the *Bacillus typhosus* was demonstrated in her stools. Again, he gives the case of Frau M., who, having suffered from typhoid thirty years before, was at length, on the occurrence of the disease in her neighbours, proved to be a bacillus carrier. It is, of course, always possible, working on these lines, to show that any given bacillus carrier has suffered from, or has been in contact with, a case of the disease, for we have thirty years at our disposal. While the significance of the presence of *Bacillus typhosus* in the stools is made clear, the method of proof adopted suspiciously resembles argument in a circle.

In the last year or two many further cases of chronic carriers have been reported. One of the most remarkable is that from New York, recorded by Soper.¹ The history of the carrier, a cook, is traced for ten years, and in seven "families" (in this designation visitors, gardeners and laundresses are included) with whom she lived during that time a case or cases of typhoid are said to have occurred. The difficulties in obtaining this record must have been great, as the cook herself resolutely declined all information, and admittedly there is doubt about certain particulars. Assuming, however, the substantial correctness of the story, it cannot be regarded as finally conclusive. Five of the outbreaks—and they include those best attested—occurred at seaside resorts near New York. Little is said about possible sources of infection other than the cook, but in one outbreak there was strong suspicion that shellfish and in another that water was at fault. "The families were of ample means and accustomed to living well." They constituted, in fact, a selected population. The problem assumes the form—Given a person, associated with a number of selected persons, first at one and then at another seaside resort, during a period of ten years, to find the chance that at the end of that time inquiry will elicit expression of a belief that cases of typhoid have occurred in correspondence with such association. If the seaside resorts were, as is probable, also more or less selected, and if at all of them, as we are told was the case at one, sewage-polluted soft clams and oysters were consumed by the "families," the a priori chance of the occurrence, apart from infectivity of the cook, of the sequence of events recorded is far from being a negligible one.

There are, moreover, certain asylum observations to which great interest attaches. Those recorded by Nieter, and by Nieter and

¹ *Journ. Amer. Med. Assoc.*, 1907, xlviii., p. 2019.

Liefmann,¹ furnish instances of successful search being made, on the occurrence of cases of typhoid, for a bacillus carrier, among a considerable number (perhaps some hundreds) of persons more or less associated with the cases. Facts of a similar sort have been recently reported by the Ledinghams.

The question here arises as to the standard to be applied in such investigations. What percentage of carriers may be expected in an asylum, apart altogether from occurrence of typhoid in the institution at the time of the examination? Klinger (1906), at the Strasburg typhoid station, found eleven bacillus carriers among 1,700 healthy individuals—0·6 per cent.² Minelli,³ in a prison where there had been no typhoid for three years, found 1 in 250 (0·4 per cent). It is noteworthy that bacillus carriers are more common among females than males, and there is a remarkable association of liability to excrete typhoid bacilli with certain pathological conditions (*e.g.*, gall-stones). The age-distribution of a population examined may be also expected to have influence. Clearly, therefore, provided standards such as those just quoted are to be applied, it must be held there is nothing much out of the common if, out of a hundred or so individuals submitted to examination (by Nieter and Liefmann or in the Ledinghams' cases), a bacillus carrier or two be found. There is a further point which should be kept in mind. Inasmuch as chronic carriers only excrete bacilli intermittently ("schubweise"), repeated examinations as a rule have to be made. If, however, a suspect be again and again examined we cannot take as our standard 1 in 100 or 1 in 200, as above; we require, of course, to know what the ultimate result would prove to be were the control population submitted to equally searching and persistent examination.

Nieter and Liefmann found thirteen carriers among 900 female lunatics—1·5 per cent.; or, if consideration be limited to a particular part of the asylum, used for some years previously for isolating typhoid and dysentery, they found seven carriers among 250 persons examined, *i.e.*, 2·8 per cent. They point out:—

(1) That their patients were women, among whom, according to Klinger, carriers are three times as common as among men.

¹ *Münch. med. Wochenschr.*, 1906, liii., p. 1611, and 1907, liv., p. 1622.

² This is the figure sometimes quoted, but as a matter of fact, Klinger has found 27 cases among 1,800 examined—1·5 per cent. In some of these there was a history of having in the past suffered from typhoid, and for this reason, apparently, they are excluded from consideration.

³ *Centralbl. f. Bakt.*, Jena, 1906, xli., p. 406.

(2) That the opportunities for spread of infection are especially great in a lunatic asylum.

(3) That the 250 inmates occupied a building to which typhoid cases had for years been sent from all parts of the asylum.

Again, they emphasise the fact that their tests were again and again repeated, and it was only as successive examinations were made that the percentage of carriers grew, for some patients who gave a negative result on a first examination yielded a positive one later. As the ultimate percentage reached was only 2·8, there seems no reason for concluding that the proportion of carriers was higher, in this institution, than it might be expected to be, on the facts at present known, in any other asylum for female lunatics in this country or in Germany.

Nieter and Liefmann themselves say: "Our observations contribute little towards determining the important and interesting question how great the risk from association with bacillus carriers is. Cases of typhoid were developed in wards in which we were able to demonstrate the presence of chronic carriers, but the transference of patients from ward to ward was such a common occurrence that too much stress should not be laid upon the local distribution of these cases."

The Ledinghams' cases and, so far as figures are given, those from Merzig, Hördt, Saargemünd and Klingemünster, referred to by Nieter, tend to confirm a belief, which may now perhaps increasingly be entertained, that the appearance of typhoid in an asylum by no means necessitates a higher percentage of chronic carriers being found among the inmates than might be expected in any similar population free from typhoid.

Nieter also quotes Friedel's case. Only one carrier was found here,¹ but stress is laid on the fact that this carrier handled uncooked vegetables in the asylum kitchen; no attempt is made to differentiate, between those attacked and those not attacked by the disease, as regards consumption of such vegetables. In gauging the significance to be attached to discovery of a chronic bacillus carrier among those handling the food-stuffs consumed in an asylum it is important, of course, to remember that many persons are more or less concerned with the supply of food to large institutions, and that the chance of discovering a bacillus carrier is enhanced *pari passu* with increase in the number of individuals submitted to bacteriological investigation.

¹ Examination of the excreta of all those employed in the asylum kitchen, scullery, milk and laundry services was undertaken. The only positive result was in a woman, aged 65, who had been for many years under observation in the asylum, and was believed not to have had typhoid.

Murchison records the fact that the President of the Society of Engineers of the day, in a letter to the *Times*, December 4, 1871, stated that "having examined many houses in which enteric fever had occurred he had in every instance been able to trace the outbreak to some unlooked-for defect in the drainage." Obviously, in connection with such experiences, as with inquiries made at the present time also, it is necessary to have regard to control observations. If a milk supply or water supply be suspected, the investigator does not content himself with discussing whether individual persons attacked had consumed the milk or water; the fact that any particular percentage of the sufferers did so does not interest him, unless he be satisfied there was a greater incidence upon consumers of the supplies in question than those supplies were entitled to show. He would, of course, estimate how many consumers of the milk or water, *a priori* (having regard to all the facts as to the distribution of the milk or water) be expected to be attacked, and only if that number was exceeded¹ would he attach importance to the degree of special incidence observed. This plan of procedure is not adopted in dealing with bacillus carriers in institutions; yet milk and water are known to have communicated typhoid; while Conradi tells us we cannot say whether the bacilli excreted by a healthy carrier are capable of conveying infection.

On a review of the facts now known the conclusion may clearly be formulated that the chronic carrier is not, as a rule, a source of mischief. It may be, as Conradi conjectures, that there are special circumstances under which he becomes dangerous, and the question in that case is, What are those circumstances? On the other hand, as the evidence at present stands, we cannot lose sight of the possibility that the chronic carrier may not be immediately concerned with transmitting typhoid fever at all. Two further questions then arise. Does the *Bacillus*

¹ As illustration of the need for laying stress on considerations of this sort may be mentioned the fact that, in an account of a recent inquiry as to the origin of 125 cases of *phthisis*, it is stated that in 13 cases out of the total number infection was probably contracted from a relative. The number of cases in which it might be anticipated there would be the appearance of such supposed transference of infection as result of chance coincidence (assuming for the sake of argument that *phthisis* is never directly transmitted from one human being to another) can be estimated arithmetically. I find that more than thirteen such instances might be expected to present themselves in 125 cases examined, as a matter of pure chance, provided it be taken for granted that the proportion of the population at the *phthisis* ages who have within the last five years manifested symptoms is not less than 3 per cent. The number (13), therefore, to which the casual reader might be disposed to attach special significance, is really just what might be expected as result of mere coincidence. Obviously it is unnecessary to seek explanation of the infection by an appeal to relatives in all, if in any, of the 13 cases.

typhosus represent a particular phase in the life-history of the specific organism of typhoid? Or, on the other hand, is the *Bacillus typhosus* merely a "secondary invader"?

Many observers, having regard to the facts that the disease is "constantly springing up in isolated cases without any possible communication," and that, when well-defined outbursts occur, the number of secondary cases is comparatively speaking small, are inclining to the view that contact from man to man plays no great part in causing spread of the disease. Arguing, moreover, from conclusively demonstrated instances of origin of typhoid from consumption of polluted water and sewage contaminated shellfish, from the involvement of dwellers near foul foreshores, and from the incidence observed in Germany and in this country upon certain riverside populations, it is natural to seek explanation of such associated circumstances in a hypothesis that the disease is, as a rule, in a wide sense of the word, "water-borne." It might then, further, be suggested that the typhoid organism has two phases in its life-history, and that in one phase it is apt to produce typhoid fever; while in the second, the *Bacillus typhosus* phase, it is only exceptionally, if at all, capable of causing extension of disease by direct contact. On the other hand, the causal organism of typhoid may be in no way connected with the *Bacillus typhosus*; and, indeed, apart from considerations already adverted to, there are several reasons for advocating a critical re-examination of the relationship of the *Bacillus typhosus* to typhoid fever. The following more particularly deserve mention:—

(1) There are the difficulties which are referred to from time to time by bacteriologists. Numerous anomalies and exceptional results have been recorded with regard to agglutination (*see*, for example, papers which have appeared in the last two or three years by Zupnik, Poggenpohl, Gaehtgens, and others). There is, further, a difficulty owing to the close resemblance—it may be the actual interchangeability—of the typhoid bacillus and closely allied organisms, notably those known as paratyphoid bacilli. Mixed infections of typhoid and paratyphoid occur, not only in individual cases, but in epidemics.¹ Fornet and Levy, and Gaehtgens, in recent papers,² have demonstrated remarkable epidemiological relationships ("epidemiologische Beziehungen zwischen Typhus und Paratyphus B."). Smallman and MacConkey have obtained results which might naturally be

¹ Paper by Thomas, "Klin. Jahrb.," Bd. xvii., H. 2.

² *Arch. a. d. kaiserl. Gesund.*, 1907, xxv., pp. 247, 250.

explained by assuming that one bacillus was changed into the other in the animal body.¹

The bacillus is not, as has been seen, always possessed of pathogenic property. It was found in the public water supply of Detmold (by Beck and Ohlmüller) in 1904, about a month after the cessation of an outbreak, and was not then causing inconvenience. The question whether the disease can be experimentally produced in animals has never been satisfactorily cleared up.² The recorded instances of accidental laboratory infection in man may have been due to causes other than ingestion of *Bacillus typhosus*, and the swallowing of cultures has given, at any rate in some cases, a negative result.

(2) A number of organisms, believed at one time to be "causal," are now classed as "secondary invaders." Particular interest attaches here to the case of the hog cholera bacillus (a near relation of the *Bacillus typhosus*), an organism long supposed to be the cause of hog cholera. It is now stated, however, that while cultures of the hog cholera bacillus produce on inoculation a disease closely resembling hog cholera, the blood of animals thus inoculated is not, while the blood of animals which have acquired the disease in a natural way is, infective. The hog cholera bacillus is regarded in America as an inhabitant of the intestine of the normal hog. Dorset, Bolton and McBryde³ point out that this state of things "is entirely analogous to the condition under which many pathogenic organisms exist—as, for example, the pneumococcus in the mouth of healthy individuals, and the swine plague bacillus (*Bacillus suisepicus*) on the tonsils of healthy hogs. . . ." They add: "*Bacillus coli communis* is a familiar example of an organism constantly present in health and yet assuming under certain conditions very great pathogenic power."

(3) The known behaviour of the bacillus, as observed in the laboratory, does not altogether accord with field observations, and

¹ See, moreover, Savage's observations on "variant forms" of *Bacillus coli*; and the work of Twort, who has shown that sugar fermenting powers may undergo change; while Stephens has made it clear that non-motility and the non-flagellate condition may be assumed by *Bacillus typhosus* under certain conditions of growth.

² Grünbaum (*Brit. Med. Journ.*, 1904, ii., p. 817) published a "preliminary communication," containing an account of the appearances produced in the small intestine of the chimpanzee by feeding experiments. His observations, he considers, "assist in fulfilling Koch's third postulate as applied to Eberth's bacillus."

³ Annual Report of the Bureau of Animal Industry, 1904.

with these the typhoid organism must comply. Thus Dr. Barry, in giving evidence before the Water Commission (1892 to 1893) said: "If it is found that what is called the specific bacillus of typhoid fever will not live under particular circumstances, as has seemed to be shown in laboratory experiments, then I think that possibly the true bacterium has not been found." During the last fifteen years a new difficulty has arisen, inasmuch as it has been ascertained that large communities can with impunity be supplied with polluted river water, for periods of some years, without manifest injury, provided certain precautions are adopted, and these, it would seem, are not of a kind which necessarily preclude the bacillus from obtaining access to household supplies.

It may be urged, on the other hand, how can the common association of a "specific organism" like the *Bacillus typhosus* with a particular "symptom complex," not only in sporadic cases but also in outbreaks of disease, be explained if the organism be a mere "secondary invader"?

To this it may be replied that for many years the bacillus was held not to occur in the blood; now it is readily demonstrated there. At one time it was believed to be impossible to single it out from the fæces; now it can be isolated from material in which there is only one typhoid bacillus to hundreds of other bacilli. With perfecting of bacteriological methods bacilli, which are now supposed to be very particular as to the company they keep, may turn out to be travelling incognito in all sorts of places. Study, at a time when there is no cholera, of material from the intestines of pilgrims at El Tor, reveals the presence of the cholera vibrio. Pratt, Peabody and Long¹ hold that the typhoid bacilli in the alimentary tract come chiefly from the bile, and that they are speedily destroyed in the intestine. Neufeldt² explains the El Tor phenomenon by assuming that the pilgrim suffered from cholera long ago, and that the vibrio has for years ceased to be quite at home in its host's intestines, but owing to slight dysenteric or other disturbances it is enabled ultimately to again come to the front. In the same way, says Neufeldt, typhoid "bacillus carriers" come under notice owing to rapid multiplication of the bacillus as result of their suffering from some derangement of the biliary secretion (gall-stones, &c.). The cholera or typhoid bacilli are always there, but the dysentery or biliary colic places them in evidence; they are representatives of the ordinary flora of the intestine brought into prominence

¹ *Journ. Amer. Med. Assoc.*, 1907.

² *Arch. a. d. kaiserl. Gesund.*, Berl., 1907, xxv., p. 164.

by special favouring circumstances. Why, then, should not typhoid fever also be competent to place typhoid bacilli in evidence? In other words, why continue to regard the presence of typhoid bacilli as necessary for the production of typhoid fever?

However this may be, some discrimination is necessary in attributing outbreaks of typhoid to contact infection. Murchison held all supposed contact cases were "as readily explicable on the supposition that the disease has had a local origin as upon that of contagion." Without accepting quite such an extreme view it is at least well to remember the caution of Bulstrode¹ that we should always, in connection with supposed contact infection in households, keep in mind the possible "continued operation of the cause, which may have given rise to the first case in any house where many cases arose."

DISCUSSION.

The PRESIDENT (Dr. Newsholme) spoke sympathetically of the absence, through illness, of Dr. Seaton. The Section, he said, had had the great advantage of listening to papers on the pathogenicity and specificity of the typhoid bacillus and the important question of carrier cases. On the one hand an able agnostic in this matter, like Dr. Hamer, said the typhoid bacillus was possibly not the bacillus of typhoid fever, and suggested that carriers of the disease did not frequently occur; while, on the other hand, Dr. Davies had given a most lucid description of an outbreak in which carrier cases figured, and in which the connection between these cases and the subsequent outbreaks was practically demonstrated. It would be difficult to imagine circumstances under which a more interesting discussion might be expected.

Dr. E. W. GOODALL said that several very important questions concerning the etiology of typhoid fever had been raised in the papers read that evening, but he would confine his remarks to three of them. The first, a fundamental one, had been raised by Dr. Hamer, who appeared to have doubts whether the *Bacillus typhosus* was the cause of typhoid fever. Nor were his doubts without support, for Dr. C. J. Martin was reported to have stated before the Royal Commission on Vivisection that the evidence that the bacillus was the cause of typhoid fever was not absolutely complete. He (Dr. Goodall) was very much surprised to read that statement, for he had been led to suppose that the experimental evidence, the unfortunately only too frequent occurrence of laboratory infection, and cases such as that of the Paris nurse who developed typhoid fever

¹ "Whitehaven Report," 1903.

after swallowing a pure culture of the bacillus with suicidal intent, were amply sufficient to prove that the bacillus was the essential factor in the causation of the disease. The second point to which he wished to refer was that of regional immunity. He agreed with Dr. Hamer that the authors cited had by no means proved its existence. It was worthy of note that Conradi attempted to account for the immunity which he believed was possessed by the native adult population of Metz by supposing that the disease smouldered amongst the babies and young children of that town. But it was a well-known fact that typhoid fever was not a common disease of very young children, so that Conradi's hypothesis was quite inadequate to explain the adult immunity, even if that immunity had been proved to exist. Thirdly, there was the question of the carriers. He was of the opinion that the explanation that had been given of these cases had gone rather beyond the facts. Dr. George Dean had recently published an account of a carrier of twenty-nine years standing, and both in that paper and in a leading article in the *British Medical Journal* which commented upon it, it was confidently stated that during an attack of typhoid fever the bacilli got into the gall-bladder, set up inflammatory lesions therein, and that these lesions subsequently recurred from time to time, apparently on these occasions stirring up the bacilli into activity. Now, as a matter of fact, all clinical observers were agreed that gall-bladder lesions were distinctly uncommon during an attack of typhoid fever. During an experience of sixteen years at the Eastern Fever Hospital the speaker had, out of a large number of autopsies, met with only two in which lesions of the gall-bladder visible to the unaided eye had been discovered. Bacteriologists stated that these carriers passed bacilli in their stools only at intervals, often at long intervals. It was extremely difficult to reconcile that observation with the gall-bladder hypothesis. Again, it could hardly be supposed that carriers were frequent, or at any rate frequently harmful. Otherwise there should be much more typhoid fever in this country than there was. Taking the average fatality of the disease at 16 per cent., according to the Registrar-General's return of deaths for the year 1906, there were every year about 17,000 recoveries from typhoid fever in England and Wales, of which he supposed a considerable number would be carriers. Another point to be remembered was that return cases, such as were well known in connection with scarlet fever, were very rare after typhoid fever. There was a fallacy by which one might easily be deceived with respect to the connection between a carrier and the outbreak of which he was supposed to be the cause. Most of these carriers had suffered from typhoid fever some time before, and were therefore immune to the disease. If such a carrier was exposed to the infection of typhoid in common with a number of non-immune persons, say by drinking infected milk, it was quite possible that the bacilli would multiply in his intestines and be passed in his stools without his becoming in the slightest degree ill; on the other hand, those persons who were not immune would fall victims to a general infection and have an attack of typhoid fever. It was possible, for instance, that Mrs. H., in the outbreak at the Brentry Reformatory, was, in common with certain other inmates, consuming milk which had been

infected in some unexplained way. Mrs. H., having already suffered from typhoid fever, would not become attacked again; but other persons, who had not had the disease previously, would become attacked. Yet bacilli might, and probably would, be found in Mrs. H.'s stools, having been conveyed to her intestines in the infected milk, and she might, quite erroneously, be set down as the cause of the other cases. Lastly, while the outbreak related by Dr. Davies and Dr. Walker Hall had been investigated with great care and attention to etiological details, the same could not be said of all the instances that had been published. The explanation of the outbreak in the Scotch asylum recorded by Dr. A. and Dr. J. C. G. Ledingham, and referred to more than once in the papers to which they had just been listening, would not bear critical examination. In that asylum cases of typhoid fever had been cropping up from time to time since 1893, and probably they had occurred before that year. Yet of the three inmates who were shown to be carriers, one had been in the asylum since 1895, when she had typhoid, another since 1896, and the third since 1904. That these persons were carriers was doubtless true, but that they were the cause of a disease which had been in existence in the institution before they went to reside in it was a proposition which could only be characterised as absurd.

Dr. C. J. MARTIN, F.R.S., said Dr. Seaton's paper demonstrated the inadequacy of water carriage as an explanation of all cases of typhoid; but he imagined that nobody believed that most fulminating outbreaks of typhoid were not directly attributable to water contamination. He understood that since the introduction of the Chamberland filter in the barracks of France typhoid fever had become comparatively negligible amongst the troops. Dr. Davies's and Professor Hall's paper had drawn attention in a striking way to the fact that there might be outbreaks due to typhoid carriers, whereas Dr. Hamer had shown the inadequacy of typhoid carriers as an explanation of epidemics of enteric. It seemed a pity that typhoid carriers had been found, because as long as enteric was accepted almost entirely as a water-borne disease the medical officer of health was in a much simpler position, as he only had to have the drains taken up and cause people plenty of expense and inconvenience, so that they realised that he was doing something. He thought that Dr. Hamer's position as an agnostic was a very reasonable one, and he felt proud that Dr. Goodall had associated him with Dr. Hamer. Nevertheless he thought Dr. Hamer was a little heretical, and a good deal of his difficulty might be answered. Dr. Hamer's conclusion was that "on a review of the facts now known the conclusion may clearly be formulated that the chronic carrier is not, as a rule, a source of mischief." With the facts at our disposal that conclusion might well be drawn, but he would point out that, supposing the chronic carrier was not an *immediate* source of mischief, the true character of the factor in the spread would be obscured. If a person got infected with typhoid, but did not have a severe attack, he might long afterwards go on distributing the affection, particularly if he got into such a position as that of cook to a regiment. Dr. Hamer also raised the question as to whether the typhoid

bacillus was the cause of enteric, and Dr. Goodall had charged him with having expressed the same heresy. He did not remember what he himself said at the Commission on Vivisection, but it was probably to the effect that the chain of scientific evidence was not entirely complete, though the probability was strong. The chain was not complete as in the case of the evidence in favour of the anthrax bacillus being the cause of anthrax. One of the points raised by Dr. Hamer was as to whether the typhoid bacillus was a secondary invader, and he referred to the analogy of hog cholera. The story of hog cholera was a very interesting one. A certain bacillus, not unlike that of typhoid, was stated to be the cause of hog cholera. There were two varieties—one favoured by Sir John McFadyean and one by Salmon—that were more or less accepted in this country and America because of their continual and almost universal association with the disease. Dr. Hamer had quoted the experiments of Dorset and his colleagues, which showed that these bacilli were not the cause, but that these organisms occasioned a terminal affection, which invaded the body towards death. Dorset's work had been confirmed by McFadyean and Stockman. When Dorset's experiments came to his notice he felt it was necessary to consider his position in regard to typhoid and many other things; but he thought there was no likelihood of our falling into the same error in regard to typhoid, as there was sufficient evidence to show that a culture of the typhoid bacillus would give rise to typhoid fever. The fact that typhoid fever could not be exactly reproduced in animals did not matter very much. At the Lister Institute there had been many observations made upon infection with typhoid cultures, and the experience had been a rather sad one. Large quantities of typhoid bacilli were being worked with which had been for numerous generations out of the human body. There were nine cases of typhoid; in fact, nearly everyone who had been concerned in these researches with large quantities of typhoid had taken the disease, so that considerable restrictions had to be placed on the progress of the work. The other point made by Dr. Hamer, namely, that the typhoid bacillus could remain in the alimentary tract without causing definite infection, very much as the pneumococcus could live in the throat without causing symptoms, had much truth in it, and there was some analogy between typhoid carriers and pneumonia carriers.

Colonel FIRTH, R.A.M.C., said he had been much impressed with the papers which had been submitted; they presented the subject in a very catholic way. From his own experience he could not go so far as Dr. Hamer, though he was much charmed by the boldness of his suggestions. There were men, doubtless, amongst those present, who had had their doubts about the precise etiological significance of the *Bacillus typhosus*, but he did not think it could be abandoned as the true causative agent of enteric fever. He (the Colonel) had had no experience of carriers, though he had done his best to find them, and, of course, his experience had been amongst soldiers. Recently a regiment came into the command in which he was serving which had enteric fever badly last summer. They were transferred to Aldershot, and a series of cases kept on cropping up at intervals among them, but search for carriers proved unsuccessful; but that

might be an accident and they might still exist. The net result of the inquiry was that in this particular series of cases he was convinced the carriers of the infection were the blankets and clothing of the men. Acting on that assumption he impounded all the blankets and bedding and subjected them to thorough disinfection by steam. Since that had been done cases had ceased to crop up; possibly there might yet be some carriers discovered. Two autumns ago he had to enquire into an outbreak of enteric occurring in a Militia battalion at Fleetwood, which was entirely limited to the officers' mess, among whom there were fourteen cases. The conditions as to water and milk were the same as for the men. There were five deaths. The cause was found to be a waiter at the mess, who was found to be an ambulatory case of enteric, and was run to earth in hospital in an almost moribund condition. It had to be recognised that in enteric one had to deal with a hydra-headed disease, and it was necessary to keep all the possible causative agencies in proper perspective; one must not say it was always the water, or always the milk, or always a personal carrier. It might be derived from a variety of subsidiary agencies, such as shellfish and watercress. The impression left upon his mind, after listening to the papers which had been submitted, was that we needed to go into each case of enteric infection very carefully and be prepared to find sources of infection where least expected. The existence of carriers could not be disputed, but it seemed probable that all carriers of the *Bacillus typhosus* were not necessarily potentially infectious at all periods of the year. The facts shown by Dr. Davies were very suggestive on this point, and it was worth bearing in mind that possibly the enteric bacillus in the alimentary canal of a "carrier" had cycles of dormancy and of infectivity. What the controlling factor was we did not know.

Dr. FRANKLIN PARSONS said it was difficult to know what Dr. Seaton meant by the "water theory." If it meant that typhoid was conveyed only by water, he did not know that anyone had maintained that. If it meant that water was one of the means of spread, he would be a bold person who would deny it. As to the small number of cases traced to water, it must be remembered that that source had long been known, and that therefore care had been taken to protect wells, &c., and thus make that means less effective. Hence the circumstance that, of the greatly reduced number of cases of typhoid fever now occurring, only comparatively few could be traced to water infection was not inconsistent with the view that in old days the water supply was a common mode of spread of the disease. With regard to the distance which infective matter might travel through fissures in the chalk strata, he mentioned the case of Beverley, in which two outbreaks of enteric fever had been reported upon—by Dr. Page, in 1884, and by Dr. Farrar in recent years. At Beverley most of the water supply was obtained from the company and a portion from artesian wells which had been sunk privately. A mile away from the company's source was a brook which, after receiving the sewage of a village, disappeared in a hole in the chalk. In 1884 Mr. Baldwin Latham made a test by putting into the hole a salt of lithium, and in a short time lithium was traced spectroscopically in the water of the company's well.

Dr. WHEATON said he ranged himself on the side of Dr. Hamer in regard to carriers. He thought it most likely that there was a connection between the *Bacillus typhosus* and some other organism which produced typhoid fever. If that were not so, why was it that in such severe and well-known outbreaks as that at Maidstone, undoubtedly produced by infection by water, the bacillus of typhoid could never be found? In these cases the bacillus could not be detected in such a comparatively sterile medium as water, yet one was constantly told that the bacillus was easily discovered in subjects of the disease in the fæces, *i.e.*, in a material positively swarming with other organisms. In institutional visitations of the disease, his experience had been that it was nearly always associated with defective drainage, and much allowance could be made for overlooking such defects when it was remembered how difficult it was to detect them and what a variety of defects was possible.

Dr. ANDREWES said he wished to mention an epidemiological point and a bacteriological one. With respect to the first, as sanitary officer to St. Bartholomew's Hospital it was his duty to make inquiry into all cases of infective disease which arose within its walls. Among those was a certain proportion of cases of typhoid. During the last fifteen years the number would work out at an average of two or three nurses per year attacked by typhoid. Much more rarely a patient was attacked—perhaps four or five in the last fifteen years. The interest of these cases is that they were practically all contact cases, for the cases arose in medical wards, not in the surgical. There had been, in his experience, one or two cases of surgical nurses being attacked, but in one, at least, of these an unsuspected case of typhoid had been present in the ward. These facts prepared him to believe in contact cases to a greater extent than Dr. Hamer appeared to believe. On the bacteriological point he confessed he found himself unable to agree with the attitude of scepticism adopted by Dr. Hamer in his paper. It would take too long to go into all the reasons for that, but he would mention one. It was known that prophylactic inoculation with the *Bacillus typhosus* conveyed a certain measure of protection. Where that measure had been carried out thoroughly and efficiently, statistics showed that the protection was of a very high order. That one fact seemed to upset the idea that the *Bacillus typhosus* had only a secondary and accessory relation to the disease.

Sir SHIRLEY MURPHY desired to mention one fact in connection with the readiness with which it was said food could be infected by a cook. Thirty or forty years ago he was resident medical officer at the London Fever Hospital, and at that time the hospital was so arranged that a small kitchen intervened between the scarlet fever ward and the typhoid fever ward. In that kitchen was kept a large receptacle for milk, which supplied the needs of both wards. The nurses were in the habit of walking out of the typhoid ward into the kitchen and ladling out the milk required for their patients, and the nurses from the scarlet fever ward did the same. How that milk contrived to escape infection during all those years passed his comprehension.

Colonel DAVIES, R.A.M.C., desired to remark on the question of conveyance through chalk. Probably most people derived their ideas as to the wholesomeness or otherwise of the water supply from the opinion of the Rivers Pollution Commission : that a chalk supply was a particularly pure one. At the Brussels Congress, in 1903, he was rather surprised to find a chalk supply regarded with suspicion ; indeed, the Congress unanimously passed a resolution that all chalk supplies should be carefully watched, on account of possible imperfections of filtration in fissured strata ; that they should be subjected to minute inquiry, geological, chemical, and biological ; and that strict supervision should be carried out, both as to the water itself and as to the catchment area. He was led to take up that point in inquiring into the supply for military camps on Salisbury Plain and with regard to sewage disposal. There might be a good layer of alluvium over the chalk, or the layer might be very imperfect ; but there was considerable risk of polluting that chalk, and therefore the water derived from it. He did not know how deep the layer of soil should be, but in some cases there was not a greater depth than 3 in. or 4 in., and that might be easily worn away. The French observer, Martel, of Paris, did not regard chalk as a filter, or even a sponge, but as a sieve. That seemed an exaggeration of the danger if the chalk in question were solid ; but if it were fissured it was quite true, and it was well known that water could not be obtained from solid chalk. In boring through chalk one had to wait until a fissure was reached before procuring a good supply, and such fissures might be miles long, and bacilli might therefore be conveyed great distances. At Salisbury Plain he made experiments to determine how far the bacteria would travel vertically ; a tunnel was driven into the hillside, and he discovered the *Bacillus coli* 9 ft. deep on ground which had been treated with sewage. That was through absolutely solid chalk, without any fissures or cracks of any kind which he could see. If the bacillus could go down 9 ft. in the time allowed, he supposed that in time it would go 19 ft. or even 29 ft., and when it arrived at a fissure it could be carried many miles, as Dr. Richards had said. One important point in regard to chalk formations was as to whether the chalk was covered with a sufficient layer of loam to oxidise surface impurities ; another important point was the existence, extent and distribution of fissures.

Major HORROCKS, R.A.M.C., said that during the last year he had been working at the typhoid problem. If he had patients in the first week of illness he could commonly recover the bacillus from the blood ; in the second and third weeks of the illness he obtained it from the fæces. He felt convinced that the *Bacillus typhosus* was associated with the disease. He had investigated the question of carriers. The cases in Gibraltar were sporadic. As medical officer of health there he had control over the civil cases, and was able to trace whatever communication there was between them, but he could not find any communication between the civil and the military cases. He went into the question of contact cases in the barrack rooms themselves, and he found that in every barrack room where there was enteric fever there were one or more soldiers giving the blood-reactions of the typhoid bacillus. As a control of that he took other barrack rooms where there were no typhoid fever cases, and, curiously,

in a series of barrack rooms where there had been no enteric for a year he found men giving blood-reactions up to dilutions of 1 in 100. Those studies were made during epidemic time—August, September, and October. He had to leave Gibraltar before he was able to complete the work in the winter; he had hoped to find out whether the same was present during the winter, *i.e.*, whether during the winter the soldiers showed the summer reactions; if not, it seemed important as showing that soldiers, during the epidemic period, had changes going on in their bodies, though he could not say whether that was due to the presence of the bacillus in their bodies. In his work he had failed to isolate the typhoid bacillus from the supposed carrier cases, but from a man in one barrack room he isolated an organism which he at first regarded as the true typhoid bacillus; it gave the reactions, except that the glucose was fermented very slowly, and it was agglutinated by a horse antityphoid serum and patient's sera in the same dilutions as the stock *Bacillus typhosus*, but when injected into a guinea-pig it did not produce a serum reacting with the stock typhoid bacillus. That was interesting, because from that barrack room he got two other cases of typhoid fever.

Dr. PRAUSNITZ said it had been stated that the typhoid bacillus had never yet been recovered from water supplies which were supposed to have produced typhoid epidemics. On the Continent a number of cases were on record in which the bacillus had been isolated from the water supplies which caused the disease. The most important of those occurred at Prague, where the bacillus was detected in the River Moldau and in the water supply of the town at the time when a considerable number of typhoid cases existed.

Dr. BUTLER said he should like to speak from the point of view of the not too incredulous practical person. The sceptic and the agnostic had approached the questions they were considering with becoming philosophical aloofness, and, ultimately, he supposed they all would still retain those scientifically acquired resources of healthy scepticism. It was not certain, for instance, that there was any uniformity in the course of Nature, and thus the basis of causation was entirely an assumption when natural science was dealt with. But for practical purposes certain observed unvarying sequences were accepted as sufficient evidence of etiological connection, and he thought he must be a bold man who did not recognise in the paper of Dr. Davies and Dr. Hall a measure of evidence of the truth of the causal connection between the carrier cases discovered and the outbreaks they were investigating, sufficient to satisfy him of the need for interference. If in the circumstances there presented nothing were done: if the sceptical attitude were maintained in practice, it was certain that the institution epidemics would not have been stamped out. Practically they were satisfied that carrier cases were effective in the spread of typhoid fever. One feature of the carrier cases which was eminently striking was the intermittency which marked the voiding of typhoid germs. On the assumption that typhoid bacilli were causally related to typhoid fever, this was a case in which the intermittency of infectiousness was definitely established. Perhaps this fact bore upon Dr. Goodall's question as to why there were not return cases of typhoid, follow-

ing those which were discharged from hospital. They must remember that it was many years before return cases of scarlet fever were recognised, although they must have been occurring since isolation was carried out. In the case of typhoid the discovery of the return cases was further complicated by the intermittent infectiousness of the infecting cases, while on the other hand typhoid fever was less common, and the return cases in consequence likely to be fewer in number. It would therefore be premature to assume that they did not occur.

Dr. BOND thought that one reason why return cases of typhoid fever were not heard of was that they were called relapses on return home, and as it is not customary to speak of secondary cases of typhoid as "return" cases, such cases are not so recorded. "Return" cases, however, do occur, for he had had at least four such cases in the Holborn borough in recent years. "Contact" cases were often heard of. In one of the districts of which he had been medical officer there had been many contact cases, especially amongst the nurses of a large hospital. When one read of the number of different germs which had been supposed to cause such diseases as influenza and scarlet fever, it was not surprising that Dr. Hamer should be sceptical as to the causal agent of typhoid fever.

Dr. DAVIES, in reply, said that there had been very little criticism with regard to the two outbreaks he had narrated, and he regretted that some of the difficult points arising in the case of "carriers" had not been cleared up. A very important question was the future control of "effective" carrier cases; for example, in the outbreaks quoted a woman inebriate concerned in the production of some sixty cases and four deaths will, on the expiration of her time, be discharged, free to take situations in institutions or families. Although Dr. Goodall was unaware of any "return" cases after discharge from his hospitals, it must be remembered that this Bristol carrier was discharged from the Royal Infirmary in 1901, and the physicians there did not know of the "return" cases until they were elucidated by the present inquiry. Dr. Goodall's warning that the presence of a "carrier" in an institution at the time of an outbreak did not prove that she was the cause of the outbreak was guarded against by the control experiment of the previous outbreak at Brislington. The few instances in which "carriers" become "effective" is explained by the necessity for opportunities such as are afforded by dealing with food. If no such opportunities are present, carriers are comparatively harmless; if their habits are dirty and careless, and they deal with food, or especially with milk, they become intermittently "effective." Sir Shirley Murphy's nurses were evidently well trained and a credit to their hospital. As to Dr. Martin's reference to "drains," and the easy way in which outbreaks of typhoid fever could be referred to them, Dr. Davies had intended to refer to the point. It was now time that the public should be taught that "drains" had a very limited connection with the causation of disease, and that a medical officer of health is not primarily interested in them. He personally referred persons wishing to discuss drains to the sanitary inspector, who was specially concerned in the matter; the medical officer of

health is primarily interested in the causation of disease, which in the case of the communicable diseases generally is a complex subject involving the study of the life-history of the causal organism and its migrations and variations in persons, animals, or places. He should be an epidemiologist first, a sanitarian afterwards.

Professor WALKER HALL, in reply, said that the clinician had begun to ask what he should do with typhoid cases as he discharged them from hospital. A very useful function would be performed by the Section if suggestions on the matter could be formulated. The public had a right to be supplied with definite information on the matter, although admittedly much yet remained to be done in regard to the bacteriology. There was also the question whether hospitals might distribute printed papers to typhoid convalescents detailing the precautions to be observed. Where a mother had been discharged after an attack of typhoid fever, and went back to her household duties, cases came back to hospital from that family. It seemed to be really a matter of the handling of food. If typhoid carriers did not have to do with food they did not seem to be a danger to the public, and that fact needed emphasising in the proper quarters.

DR. RICHARDS, in reply, said, in reference to Dr. Goodall's remark concerning return cases, there did not seem any very distinct line between contact cases, return cases, and carriers. Return cases were only carriers which occurred in a limited time. For a long time his experience was the same as Dr. Goodall's. He had not seen a definite return case until last year, and then a patient failed with enteric fever three months after the return home of the father. Yet there were only about fifteen cases in Croydon in that year. At about the same time the father developed an obscure abdominal abscess, probably perinephritic, which discharged through the bladder; and probably that was the cause of the infection in the child. He could not complete the case bacteriologically because the man was admitted into a London hospital, where no bacteriological examination was made. It seemed to be a genuine return case of enteric fever.

Dr. HAMER, in reply, said that there were two main classes of difficulties to be faced; there were those arising out of the association of institution outbreaks with chronic carriers, concerning which he had already spoken, and there were those connected with cases of laboratory infection. Some of the last-named were not worth much; little detail was given; or, again, alternative explanations were possible. For instance, there was the case referred to by Dr. Goodall, that of the hysterical French girl. Those who read the original description of that case would certainly feel that it was by no means conclusive. He remembered discussing the question of the typhoid bacillus some time ago and being silenced by being told that the one argument which was unanswerable in this connection was that based upon the cases of laboratory infection. He (Dr. Hamer) had been interested, on looking into this matter since that time, to find the matter was not free from all doubt, for it was admitted that the conditions of scientific experiment were not rigorously fulfilled in these laboratory

experiments. The cases mentioned by Dr. Martin were certainly difficult to explain away, but even with regard to them there remained, perhaps, the possibility that there were circumstances in common, other than the particular circumstance held to be incriminated; workers in laboratories were, moreover, oftentimes liable to be infected by original material as well as by the bacilli in pure cultures. In reply to Dr. Andrewes, he could not agree that the prophylaxis difficulty was a fatal one; it was generally admitted there was close association between typhoid fever and the typhoid bacillus, and that being so, cultures of typhoid bacilli might conceivably have a prophylactic effect. The existence of such effect, if demonstrated, would not necessarily prove that the typhoid bacillus was the causal organism of typhoid fever.

Epidemiological Section.

April, 1908.

On an Epidemic of Small-pox of Irregular Type in Trinidad during 1902-4.

By R. SEHEULT, M.B.

SMALL-POX was so prevalent in prevaccination times that hardly anyone escaped the disease. It entered the palace of the king with the same freedom as it did the hovel of the peasant; it penetrated everywhere, carrying desolation with it. Those who escaped death were left disfigured or crippled for life; almost every face was seamed and scarred, and on every side were met the blinded victims of the scourge. At times whole towns were depopulated. When the contagion fell upon virgin soil it raged with special virulence and wrought dreadful havoc. Among the black races, whole tribes were extirpated; its ravages were then fearful to contemplate, and the mortality which followed in its train was appalling. Macaulay, in his "History of England," thus alludes to this scourge in speaking of Queen Mary's death from it in 1694:—

That disease, over which science has achieved a succession of glorious and beneficent victories, was then the most terrible of all the ministers of death. The havoc of the plague had been more rapid, but the plague had visited our shores only once or twice within living memory. The small-pox was always present, filling the churchyard with corpses, tormenting with constant fears all those whom it had not yet stricken, leaving on those whose lives it spared the hideous traces of its power, turning the babe into a changeling at which the mother shuddered, and making the eyes and cheeks of the betrothed maiden objects of horror to her lover.

Even more impresssive than this classical picture of the great historian is the evidence presented by statistics, in which is crystalized the experience of entire nations. The features of this loathsome

and destructive disease were then familiar even to the man in the street, and medical men had ample opportunities of becoming thoroughly acquainted with its various manifestations; but since the discovery, or, more correctly speaking, the introduction, of vaccination by the immortal Jenner, this most dreaded of all the infectious diseases has been by degrees stamped out in all civilized countries, or at any rate its prevalence has been lessened to such an extent that there are nowadays many experienced physicians who have never seen a case. Furthermore, the practice of vaccination has rendered the diagnosis more difficult, as the phases of the disease have been made by it far more numerous and intricate than they were before. It is not surprising, therefore, since its epidemic character has been so greatly modified by vaccination and other causes, that difficulties in recognizing its true nature are experienced at times.

After the great pandemic of 1871—2, small-pox did not again appear in the Colony of Trinidad until April, 1902, when the disease was introduced in a very mild and irregular form, giving rise to considerable diversity of opinion in regard to its nature. Among the sixty medical practitioners in the island there were not eight who had had any experience of this disorder; and even the doyen of the medical faculty there, who had witnessed the terrible ravages of small-pox in 1871—2, was misled by the aberrant symptomatology of the disease in this latter epidemic, and failed to recognize its true nature. The outbreak, which commenced in 1902, appears especially deserving of detailed study, having in view the interesting points connected with the origin and spread of the epidemic, the somewhat anomalous features presented by the disease, the instructive results obtained in regard to the relation of vaccination to it, and, above all, the mortality, which was so strikingly low.

The following account of the origin of the epidemic in Trinidad is taken from a pamphlet by Dr. Dickson, the Assistant Medical Officer of Health, and Dr. Lassalle, Assistant Surgeon, Colonial Hospital, Port-of-Spain, entitled "Varioloid Varicella in Trinidad." This paper was read at the meeting of the British Medical Association at Swansea in 1903:—

The first case of which there is a record was that of an inmate of the Lunatic Asylum, St. Ann's. The asylum is situated in an isolated position, beyond the limits of the town. This patient had been an inmate of the asylum for some years, and developed the disease on April 16, 1902. The case was isolated on the appearance of the rash, but other cases appeared during May, June, July and August, until nineteen inmates and attendants, all adults, were

affected. The source of infection could not be traced, and must have been either a visitor or attendant who had a mild attack and escaped notice. The cases were returned as "varicella," but the medical superintendent has since reported that they were similar to the cases of eruptive fever now occurring, and in one instance—that of an attendant who had the disease in August, 1902—a few pigmented marks identical in appearance with the macules already described were visible up to a month ago. It is of interest, that of the nineteen cases, ten were in vaccinated and six in unvaccinated persons, and in three the evidence of vaccination was doubtful. The patients most severely attacked were an inmate vaccinated in infancy and an attendant revaccinated in 1898, and showing three good marks of successful vaccination.¹

On May 2, 1902, a similar case in an adult was reported from Woodbrook, a suburb to the west of Port-of-Spain. Cases next occurred in Dundonald Street, in the north-west of the town, in September. Early in October a woman who lived in a barrack-yard in the south-east of the town developed the disease within a fortnight of her arrival from Yrapa, in Venezuela. About the third week of October a case, that of a trader who had recently come from Guiria, in Venezuela, occurred in Duke Street, about the middle of the town. Both of these cases lived in densely tenanted barrack-yards, did not seek medical aid, and were not reported at the time; other inmates of these yards were subsequently affected, but this fact was discovered only in the early part of December and after they had recovered. During November eleven cases occurred in the middle and south-east of the town, and though in all probability the two cases above quoted were the sources of infection, yet there is ground for believing that in three of the cases the contagion was derived from other sources. Five of the cases occurred in one yard in Duncan Street in the first week of November, and of these, two who showed the most distinct vaccination marks were most severely attacked. During December eight cases were reported from the eastern, south-eastern and middle portions of the town. Of these, one was a vagrant who developed the disease within a week of his arrival from Yrapa. In January, 1903, a house to house inspection was instituted, other cases were discovered in various parts of the town, and the disease began to assume epidemic proportions. At first the majority of persons affected were hucksters, sailors and quay labourers, that is, were of that class of the population which would earliest be exposed to contact with an imported disease.

Reports of the prevalence of a similar disease in the adjoining coastal villages of Venezuela had for some time been circulated, and early in February information was received that several deaths had occurred, and that the disease was now stated to be variola. With the view of obtaining accurate information a commission of two medical practitioners, one of whom had had extensive experience of small-pox, was sent to Venezuela to investigate and report upon the nature of the eruptive

¹ With regard to the influence of vaccination *see* p. 281.

fever prevalent there. The commissioners visited Yrapa and Guiria. The following extracts are taken from their report :—

The disease had existed in Yrapa for nearly a year and had not varied in character, that is, had always been a mild affection. Two deaths had occurred in the country around ; one was that of a chronic alcoholic, the other died probably more from privation and neglect than anything else. We visited Messrs. Fournelli and Cottin, both Frenchmen long established in Venezuela. Their household had not been attacked, and they were under the impression that Europeans were spared. Mr. Fournelli stated that in Carupano, where there was a large European community and where this disease had been very prevalent, no European had been attacked. These gentlemen informed us that no alarm was ever felt at Yrapa about the sickness, that they called it "lechina" (Spanish for chicken-pox). As a proof of the mildness of the disease they referred to the attack of Guiria by the revolutionary forces from Yrapa, where many of the troopers, though covered with the eruption, carried their Mausers cheerfully to battle.

The commissioners came to the conclusion that the disease was exactly of the same nature as that occurring in Port-of-Spain, and that it was not small-pox. They expressed the opinion that the disease was imported into Trinidad from Yrapa. There is a large daily passenger and trade traffic between Port-of-Spain and the villages on the adjoining Venezuelan coast, and the voyage does not occupy more than a day. Under these circumstances, and in view of the instances above quoted, there seems to be little doubt that the disease was introduced into Trinidad from Venezuela. I may here add the population of Yrapa is about 12,000 and is practically unvaccinated.

So aberrant and misleading were the clinical features of the disease that its real nature was unrecognized in Trinidad except by a few. As I had charge of the isolation hospital for seven months, and treated 564 cases, I had the opportunity of studying closely its various manifestations. I was also placed in charge of the maternity ward, where fifty-one women, who had the disease during pregnancy, were delivered.

Three different theories were advanced to explain the nature of the "eruptive fever." At the commencement of the epidemic, and indeed for a considerable time after, many of the medical men in the Colony considered the disease to be chicken-pox of an aggravated form ; the coexistence of syphilis and other constitutional taints, as well as the presence of diathetic tendencies, were put forward to explain the unusual severity of many of the cases. This theory was eventually abandoned by all.

Those who could not countenance or accept this view of the nature of

the disease, and yet did not feel justified in considering it to be small-pox, suggested the possibility of the existence of a hybrid between variola and varicella, just as rubella was once considered by Schönlein and other writers to be a hybrid between scarlatina and morbilli. This theory, however, was never seriously maintained, but many were of opinion that the disease was a specific entity, and called it "varioid varicella," owing to its supposed similarity to an eruptive fever which occurred in epidemic form many years ago in Jamaica, and was described under that name by Dr. Izett Anderson, of Kingston.

I need not comment upon the name "varioid varicella," which is wholly unscientific and misleading, but some reference to the possibility of the existence of a new disease in the form assumed by this epidemic may not be out of place here. It is well known that at one time measles, scarlatina, rubella and the "fourth disease" were included under one name and were regarded as one malady. With the progress of medical science they were gradually differentiated one from another, so that at the present day they are considered to be perfectly distinct and definite diseases.

It was not until the close of the seventeenth century that scarlet fever was distinguished from measles, whilst the differences between these two diseases and rubella were fully indicated only about the middle of the eighteenth century, when that disease became known as "roseola." The existence of the "fourth disease" as a specific entity has been claimed within very recent years.

Similarly small-pox was for a long period confounded with measles, and even in the sixteenth century, when the former disease was generally recognized, errors of diagnosis were not infrequent. English writers in the early part of the eighteenth century mention varicella as a variety of small-pox, but the end of that century saw the differences between them clearly established.

Can the eruptive fever which forms the subject of this paper be regarded as the "third disease" in the second group of infectious diseases which I have mentioned above, taking its place between varicella and variola? I think not.

The evolution of the diagnosis of the infectious fevers was no doubt in the main due to careful clinical observation, but in those instances, where inherent difficulties of diagnosis existed by reason of very close resemblances, the application of Cullen's law was necessary. "One attack of an eruptive fever entails immunity from a second attack in the same individual during childhood." This law has been regarded as a means of

differentiating some of the very closely allied eruptive fevers, and, indeed, as the final test in their elucidation; even now, where the bacteriologist fails to enlighten in such cases, it may prove a very valuable test. The opportunity for the application of this principle in the present case has not arisen, but we have in vaccination a somewhat analogous and equally convincing method of differentiation which can be applied to distinguish other eruptive diseases from variola. Vaccinia and variola are mutually protective, and if the same relation exists, as I shall endeavour to prove, between vaccinia and the disease under review, it is reasonable to infer the identity of the latter with variola.

Although some of the characteristics of the Trinidad epidemic were very unusual and aberrant, yet the more salient features of the disorder were identical with those of small-pox, so that apart from the vaccination test there are grounds for the belief that the two diseases differed only in type. In connection with the theory that the disease was a new malady, the recent volcanic disturbances in the West Indies, notably in Martinique and St. Vincent, appealed to the popular mind, and the disorder was promptly attributed to these convulsions of Nature.

The third view on the subject, and in my opinion the correct one, as I have already indicated, was that the prevailing eruptive fever was an irregular form of small-pox. To Dr. Masson is due the honour of having been the first to recognize the variolous nature of the disease. Early in November, 1902, he was called to see, in Duncan Street, Port-of-Spain, a few cases of an eruptive fever which he at once suspected to be small-pox. In this the Acting Surgeon-General of the Colony and the Assistant Medical Officer of Health and others who saw these cases did not concur; they held the opinion that the disease was chicken-pox. In accordance with this official declaration no steps whatever were taken to prevent the spread of the disease or to circumscribe its area of infection until much later, when it became so widespread as to be almost beyond control. On the other hand it must be admitted that it would have been difficult to prevent dissemination in view of the extreme mildness of a large proportion of the cases. In any case the failure on the part of the Health Department to recognize the true nature of the disease led to its wide diffusion in the town and its invasion of the country districts. This was a blessing in disguise, for the disease not only retained its mild character throughout the epidemic but it spread far and wide in the country, so that a large proportion of the population have become

immune from small-pox at a very small sacrifice of lives, through protection afforded either by an attack of the disease or by the operation of vaccination, which the people largely availed themselves of. Fortunately the clamour of the anti-vaccinationists has not yet reached this Colony, nor does a "conscience clause" exist in our Vaccination Ordinance. Dr. Masson was not satisfied with the decision arrived at by the health authorities. Early in December, 1902, he visited Barbados, another West Indian island, which was in the throes of a small-pox epidemic of a more or less mild form, with the object of studying its clinical features and for the purpose of comparing them with those of the cases which he had seen in Port-of-Spain. His observations in Barbados only confirmed his former views on the matter. At first the medical men in Trinidad felt great difficulty in accepting his diagnosis owing to the unusual and variant features of the disease, but subsequently, when they became more intimately acquainted with the epidemic, many recognized the correctness of his contention.

In the meantime the disease, which had hitherto spread very slowly—so slowly that it did not attract any particular attention—began to assume epidemic proportions in the town at the beginning of the year 1903, and to cause much alarm and anxiety to the authorities. Early in 1903 certain measures were adopted to repress its growth. As many cases as possible were sent to the Isolation Hospital, but for want of accommodation the vast majority of the patients were treated at their homes. In February, 1903, two medical men were specially appointed for this purpose. Contacts were vaccinated, and revaccination was encouraged generally. The disease continued to spread, and, owing to its mild character, many of those affected by it were seen in the streets in its various stages, and in some instances they were actually able to pursue their daily labours. In order to protect the public health against the so-called "varioid varicella," certain regulations were made by His Excellency the Governor in Executive Council, but these were never strictly enforced, and the disease followed untrammelled its own course and spread throughout the whole island.

From April 16, 1902, when the first case was discovered, to December 31, 1902, there were only sixty cases reported. The extremely slow and insidious spread of the epidemic was one of the circumstances which led the profession to persist in the error of diagnosis. The negro race is known to be especially susceptible to the contagion of small-pox, and when their conditions of life in crowded barrack-yards and their ignorance of ordinary sanitation are considered, the slow advance of the outbreak

is very remarkable. It was only in January that the outbreak began to assume epidemic form, reaching its maximum height in May, and then gradually declining until its entire disappearance from the town in November, 1903, and from the country in January, 1904.

It must be borne in mind that although the native population is a fairly well vaccinated one, owing to the rigidly enforced Vaccination Ordinance, there is a large influx of unvaccinated immigrants from neighbouring islands and from Venezuela, where apparently vaccination is not in great favour. For ten years ending in 1900 the average proportion of vaccinations to births in Trinidad was 83·11 per cent. In the year 1898 the corresponding proportion was 96·48 per cent. Such a result is not probably equalled in any other part of the British dominions. Among the 564 cases which came under my observation in the isolation wards only 118 were Trinidadians, the rest being aliens, and of these 254 hailed from Barbados (*see* Table I.). The protection afforded to the Colony against an epidemic of small-pox will not be complete until provision is made for the successful vaccination of the large number of unvaccinated persons coming from the other Colonies and the adjacent continent. Every immigrant should be required to exhibit proof of successful vaccination before being allowed to land in this country, as is done in some States of America.

The slow spread of the epidemic was due to the slight infectivity of the disease. In many cases the contagion or virus seemed to require intimate contact for its transmission from one person to another, and even then it was remarkable how frequently instances were found in which such contacts escaped infection. The Assistant Medical Officer of Health, in a pamphlet already referred to, mentions that in several instances in barrack-yards persons in close association with those affected by the disease did not contract it and subsequently reacted to vaccination. Such a case came under my own observation. A large number of patients were admitted to the general wards of the Colonial Hospital in the incubation or invasion period and were removed to the Isolation Hospital, only a day, or sometimes two days, after the appearance of the rash, and yet no fresh infection took place in these wards. Two cases which developed the disease in the House of Refuge were transferred to the Isolation Hospital in the vesicular stage and none of the other inmates contracted the disease. Four cases which were sent to the male and female prisons in the incubation period were removed to the small-pox wards only after the rash had appeared, and yet there was no spread of the disease in these institutions, although there was no disinfection of any

of these buildings. It was frequently observed that children born of mothers in the invasion period or early eruption stage of the disease escaped infection when they were removed from the mother within two or three days after birth, but when left with her until pustulation or desquamation had commenced they invariably contracted the disease. The isolation wards were only 99 ft. from two of the nearest general wards of the Colonial Hospital, and only one patient in each of these wards developed the disease; one was thirty days and the other sixty-five days in hospital before the initial symptoms of small-pox showed themselves. It may be remarked that there were at this period more than 100 small-pox patients in all stages of the disease under treatment in the isolation wards. From these observations it may be inferred that the infectivity of the disease was slight, that the most active period of infection was during pustulation and desquamation, and also that aerial convection, which is held by some recent observers to play an important part in the dissemination of small-pox, was apparently not concerned as a factor in the diffusion of this epidemic.

The mode of spread of the disease to the country districts was also very interesting. It was only in January that the disease occurred in two districts, Tacarigua and Blanchisseuse, which are widely separated from each other. The cases were derived from Port-of-Spain, and occurred on January 8 in the one and on January 24 in the other. The next cases in these districts occurred on February 5 and 12 respectively, and no further cases appeared until April 3 and May 1. The first case which occurred in Blanchisseuse was that of a man who arrived on January 21 from Port-of-Spain, where he had associated with persons suffering from the disease. Three days after his arrival he developed the initial symptoms of the disease.

In March several other districts became infected; the diffusion of the contagion to the country districts in March is readily accounted for by the fact that there is always a large influx of country visitors to the town to witness the annual "carnival," which is held at this period of the year.

The first case which was admitted to the Isolation Hospital was that of a woman who was received into one of the general wards of the Colonial Hospital with an infant 35 days old, on November 22, 1902. On December 4 she developed the prodromal symptoms of small-pox, and was then transferred to an isolated room with her infant. I afterwards discovered that this patient had come from a house where there were several cases of "eruptive fever." Her child developed the

disease on December 21, 1902, that is, seventeen days after the mother had shown symptoms of small-pox. On January 4, 1903, it was found necessary, on account of the number of cases seeking admission to hospital, to provide further accommodation. Accordingly a ward containing sixteen beds was opened on that day, but at the end of February it had become so overcrowded that another with twenty-two beds was provided on February 28. On March 1, forty-two patients were under treatment. Owing to the rapid spread of the epidemic during this month both wards soon became overcrowded. On March 19 there were no less than sixty-six cases in hospital, so that only the urgent cases were then admitted. On March 27 the number had risen to eighty-six. A third ward with seventy-five beds was opened, but in a very short time this increased accommodation was barely adequate, for on April 2 there were no less than 103 cases under treatment. In May a gradual decrease in the number of cases seeking admission began to take place, and this continued until October. The last patient was discharged on the 19th of that month.

This eruptive fever, as already mentioned, was at its onset officially declared to be chicken-pox, but this diagnosis was revised and altered in the month of March, 1902. The disease then became known as "varioid varicella," a name which it bore to the end of the epidemic. These diagnoses were accepted without demur by almost all the medical men in the island. Early in 1903 disquieting rumours and conflicting views on the subject of the "Trinidad eruptive fever" determined the government of Barbados to send Dr. Bridger, the medical officer in charge of their small-pox hospital, as a special commissioner to investigate and report upon it. He arrived in Port-of-Spain on February 2, and furnished the government of Trinidad before his departure on March 8 with a report in which he declared the disease to be small-pox of a very mild type. Two days after the receipt of this communication, a meeting of the medical board of the Island was convened, at the special request of His Excellency the Governor, for an expression of opinion upon it. Thirty-four members attended the meeting, the report was read, and after a full discussion on the subject the following resolution was passed with only three dissentients:—

"That no such disease as mild small-pox exists in epidemic form, and that the eruptive fever now prevailing in Trinidad is not small-pox."

Such, then, was the almost unanimous view of the medical profession in Trinidad in regard to the epidemic at that period. The difference of opinion between the Barbados Commissioner and the Trinidad

medical practitioners gave rise to a bitter controversy; the columns of the Press of both islands became the channel of much abuse and recrimination. Severe comments were made in some of the British medical journals, which reflected little credit on the diagnostic acumen of the West Indian medical practitioners, and much ridicule was levelled at the profession.

In justification, or rather in extenuation, of the doubt and hesitancy as to the nature of the epidemic, it may be stated that anomalous forms of eruptive fevers, and especially of small-pox, have, at all times, presented similar difficulties of diagnosis, even to experienced observers, causing in many instances much diversity of opinion. Further on I shall refer to two epidemics of a peculiar form of small-pox, popularly known as "swine-pox" and "pearl-pox" respectively, which occurred in Jenner's time. We find in the *Proceedings of the Epidemiological Society of London* a paper entitled "Varioloid Varicella in Jamaica," which was read by Dr. Izett Anderson before that Society in 1867. He describes under that name an eruptive fever which occurred in epidemic form in Jamaica in 1863. He states that in some cases the eruption was apparently that of simple varicella, whilst in others the "inexperienced" would have pronounced it to be that of "variola." The disease attacked young and old, the vaccinated as well as the unvaccinated, and even one or two persons who had had small-pox in 1852, that is, eleven years previously. There was no constitutional disturbance in the majority of the cases, and no necessity to confine the patients to bed. Some malaise and feverishness, but no continued fever of any intensity, preceded the rash; the fever existed for two days, and papules appeared on the third day, usually first on the face in the severer cases, and within twenty-four to forty-eight hours they became vesicles, with sometimes a depression in their centre; the vesicles were then transformed into pustules. The full development of the eruption was attained on the fifth or sixth day of the disease and desquamation followed. Macules and pitting sometimes resulted. The larynx, and in one or two instances the conjunctivæ, were occasionally affected. Secondary fever or anything approaching to it was almost always absent. In the mild cases the vesicles aborted. The epidemic lasted four or five months, and was apparently unattended by any mortality. The disease originated in a penitentiary, and no source of infection from outside could be traced; a fortnight after the appearance of the first case a boys' reformatory, three miles away from the penitentiary, with which there was daily communication, became infected, and forty of the inmates contracted the disease. About a fortnight after the first case appeared in the boys'

reformatory the disease broke out in the girls' reformatory, which was half a mile away, and thirty of the inmates were attacked. The disease apparently did not spread to any extent among the general public, although there was communication between the infected institutions and the outside world.

It would appear that the disease was not invariably regarded as varioloid varicella, for in a memorandum Dr. Bowerbank, of Kingston, writes in 1863 :—

We are at present suffering from a severe influenza and also from a most peculiar epidemic of varicella, I suppose. To me it looks much more like "varioloid" or modified small-pox. Most of the vesicles suppurate and in some instances are distinctly umbilicated and are sometimes confluent. I never saw varicella like this before.

In connection with this epidemic in Jamaica it is interesting to note that a fatal form of small-pox, which was introduced from Colon, followed in 1864. It would be interesting to know whether those who were attacked in the previous epidemic were affected by this fatal form of the disease. The eruptive fever described by Dr. Anderson certainly bears very close resemblance to that which broke out here, but it appears to have been milder in type.

Again, more recently, in the *Lancet* of October 22, 1898, Drs. Thomson and Brownlee record their observations on an infectious disorder in Lascars, having close relations with small-pox and chicken-pox. This infectious disorder appeared to resemble both of these diseases in certain respects and yet to possess symptoms alien to both. After careful consideration the diagnoses of small-pox and chicken-pox were excluded and the disease was regarded by these observers as a specific entity.

I do not share with these observers the opinion that the Glasgow epidemic was identical in nature with that which was reported by Dr. Anderson. The differences between it and the Trinidad eruptive fever are even more marked.

In a pamphlet reprinted from the *Journal of the American Medical Association*, August 3, 1901, Dr. Heman Spalding, Chief Medical Inspector, Department of Health, Chicago, discusses the diagnosis of a mild and irregular form of small-pox which broke out in the United States in 1899. The following extract from this paper indicates the difference of opinion which existed in various parts of the United States in regard to the nature of that outbreak :—

From March 9, 1899, to June, 1901, 310 cases of small-pox have been found in Chicago; sixty-four of these, in various stages of the disease, were imported

into the city from nineteen of the surrounding States, and the cases came from as far east as New York and from as far west as California. In the meantime I visited three of the neighbouring States, where the diagnosis of this disease, variously called *impetigo contagiosa*, "giant chicken-pox," "Cuban itch," or some other indefinite name, was in dispute. With this opportunity of observing cases from such widespread and various sources, I think it is fair to assume that the disease we call small-pox in Chicago is the same disease which has been the subject of controversy in all parts of the United States.

In the *British Medical Journal* of May 11, 1901, Dr. Montizambert, Director-General of the Public Health Department, Ottawa, speaks of a mild type of small-pox which was undoubtedly of the same nature as that referred to by Dr. Spalding, and probably similar to that which broke out in Trinidad. In this article, which is entitled "Notes on a Mild Type of Small-pox (*Variola ambulans*)," the author writes:—

The Dominion of Canada is now being threatened with, and in some cases invaded by, small-pox from her neighbour, the United States. It began on this continent several years ago in the United States, the southern States especially. It has gradually spread northwards. Its origin is difficult to establish, either as to time or place, with any historical accuracy. It has been attributed by many to soldiers returning from Cuba or from the Philippines. But it is certain that it was prevalent in the United States before the beginning of the war between that country and Spain. The difficulty in tracing back its history is due in great part to the unusual mildness of the type. Many cases were diagnosed as chicken-pox, many as German measles. In many of the lumber camps it went by the name of "cedar itch."

In the *Lancet* of July 4, 1903, p. 65, reference is made to an outbreak of disease in Cambridge which appears to have caused some doubt and uncertainty in the minds of the health authorities. The main features of the disease seemed at first incompatible with small-pox, and the diagnosis of chicken-pox was made; as the epidemic increased in severity, however, expert advice was sought, and Dr. Wanklyn, the referee to the Metropolitan Asylums Board, who was invited to examine the cases, reported the disease to be undoubtedly modified small-pox.

From these few examples it will be seen that sometimes irregular forms of small-pox present great difficulty as regards diagnosis, raising doubt even in the minds of the experienced. The strictures, therefore, which were passed by those who were not confronted by this atypical variety of small-pox were unmerited and unjustified. The nature of the Trinidad epidemic was apparently similar to that described by Drs. Spalding and Montizambert. The disease probably originated in the southern States of North America and travelled northwards to Canada

and southwards to South America, whence it was imported to this Island as already pointed out.

The main difficulties which presented themselves in the diagnosis of the disease in Trinidad will best be appreciated when the features and peculiarities of the epidemic have been considered.

Definition of the Disease.—A communicable febrile disease characterized by definite periods of incubation, invasion and eruption, the last passing through successive stages of papule, vesicle, pustule and crust.

INFLUENCE OF (1) AGE, (2) SEX, (3) RACE, (4) SEASON.

(1) *Age* (see Appendix, Table II.).

The youngest patient attacked was aged 2 weeks, whilst the oldest was aged 89. Adults were far more frequently affected than children; 56·20 per cent. of my cases occurred in adults between the ages of 20 and 34, whilst only 12·23 per cent. occurred amongst children aged under 14. This is exactly what one would expect in an epidemic of small-pox occurring in a vaccinated community such as exists in Trinidad, where a Vaccination Ordinance which is strictly enforced requires the successful vaccination of all infants before the age of 3 months. Again, amongst adults more were affected during the quinquenniad 20 to 24 than during any other, and amongst twenty-one children under 5 years of age, twelve were unvaccinated infants whose ages ranged from 2 weeks to 4½ months (see Tables III. and IV.). These figures clearly indicate the rôle which vaccination played in connection with the disease.

Even the foetus was sometimes attacked, and the earliest period at which this occurred was after four and a half months of intra-uterine life. Four such cases came under my observation. Fifty-one pregnant women were admitted to the maternity ward after recovery from the disease. Eleven aborted and nine were delivered prematurely. In the aborted cases, eight of the foetuses showed distinct evidence of an attack of the disease; and of the prematurely born four showed external manifestations of it, including a case of twins. All those who were attacked were born in the eruptive stage of the disease except one, which presented the characteristic macules on the body and a deep scar on the left cheek. The history of the twin case referred to above is interesting.

The mother developed the initial symptoms of small-pox on March 23 and the rash appeared on the face on March 26. Three days before the onset of the invasion period she was vaccinated, and both vaccinia and variola ran their course concurrently; the vaccine vesicles were typical and the attack of small-pox was moderately severe. On April 17, when she was in the desquamating stage of the disease, she was delivered prematurely at the seventh month of twins. Both fœtuses showed the eruption of small-pox—white macerated vesicles—sparsely scattered on the scalp, face and trunk and limbs, including the palms and soles (fig. 1). There was one large placental mass which was partially implanted in the lower uterine segment. Each fœtus was enclosed in a separate bag of membranes. The first fœtus was stillborn and the second died a few minutes after birth. In this case the fœtuses were apparently infected simultaneously, or almost simultaneously, with the mother. In the other cases there was no correspondence as regards date of disease in mother and child, although allowances were made for the peculiar conditions which affect the evolution of the rash in the fœtus. The disease was much more advanced in the mother than in the fœtus. It would appear, therefore, that either the incubation period is longer in the fœtus than in the adult or that the fœtus becomes infected after the disease has reached the eruptive stage in the mother. The liability of the fœtus to the disease seemed to decrease directly with its age.

The remaining thirty-one pregnant cases were delivered at term, and of these one woman gave birth to a child showing evidence of having passed through a complete attack of the disease. In this case the mother contracted the disease in May, 1903, and was delivered in the following July of a healthy female child with nine macules sparsely scattered on the left cheek, right lower eyelid, right arm, both forearms and buttocks (fig. 2). A similar case came under my observation in which the mother developed initial symptoms on July 29, 1903, and was admitted to the Isolation Hospital on August 6. She was discharged well on September 5, and on the 21st of the same month gave birth to a full-term infant with twenty-seven macules scattered on the face, trunk and extremities, and one mark with a depressed centre on the right cheek. The macules on the extremities were smaller than those on the face and trunk. In no instance was the eruption copious in the fœtal cases, though the majority of the mothers were severely attacked. It was also noticed that the face was not more affected than any other part of the body; this observation supports the theory that light influences the distribution of the rash in the adult.



FIG. 1.

Seven months twin foetuses, with vesicles sparsely scattered on the scalp, face, trunk and limbs, including palms of hands and soles of feet. One foetus was born dead and the other lived only a few minutes.



FIG. 2.

Mother, aged 28; unvaccinated. Had small-pox in May, 1903, and was delivered in following July of a full-term child. Child aged 4 days. Macules on buttock.

my—7

In the cases where the fœtus showed evidences of an attack of the disease *in utero*, we must assume the passage of the germs into the fetal circulation. This would seem to require a breach of continuity in the walls of the maternal vessels in the placenta, if this organ acts normally as a barrier to microbes. The disease in the mother may undoubtedly produce pathological changes in this organ. Toxins and antitoxins, on the other hand, probably pass, along with nutrient matters, by osmosis. Recent investigations seem to show that the placenta has a selective power and is something more than a mere filter; in that case the existence of a placental lesion may not be necessary to explain the passage of the micro-organism of small-pox, and the transmission of its toxins may take place in a more complicated way than by osmosis.

The proportion of cases of fœtal infection which came under my observation in this epidemic appears to be unusually large, but the fact that in small-pox of ordinary severity the mortality amongst pregnant women is high, and that abortions or premature labours occur more frequently, and before the external signs of the disease in the fœtus declare themselves, explains this difference.

(2) *Sex* (see Table II.).

Amongst my cases more males were affected than females, in the proportion of 352 to 212, and the number of attacks was greater absolutely among males than females at all ages except in the quinquenniad 10 to 14, the numbers being fifteen and nineteen respectively.

(3) *Race* (see Table V.).

The blacks were almost exclusively attacked, very few persons among the white section of the community suffering from the disease. This fact is in conformity with the observation that the negro race has a peculiar susceptibility to small-pox; but in this epidemic the case mortality was, contrary to all experience, exceedingly low amongst this class. A very significant fact was the immunity enjoyed by the East Indian population. This is to be attributed not to racial influence, but rather to the protection afforded by efficient vaccination and revaccination; the "coolies," as they are called here, are particularly well vaccinated. Their vaccination marks are numerous and large. There was only one East Indian amongst the 564 cases that came under my care. The estimated population of Trinidad is 280,000, and that of the East Indian section of the community is 90,000. One of the most popular suburbs

of Port-of-Spain is peopled mainly by East Indians, not one of whom contracted the disease, although many cases occurred among the blacks living in their midst. It is certain the sanitary conditions under which these people live do not account for this immunity, for their habits are primitive in all matters concerning public hygiene. This consideration, however, may be of little moment, for it is a fairly well established fact that while general cleanliness and purity of water and food are useful against all diseases, the prevalence and spread of small-pox are not affected by hygienic conditions as some of the other infectious diseases are, though naturally overcrowding favours its propagation.



(a)

FIG. 3.

(b)

F. W., female, aged 13; unvaccinated.

- (a) Photo taken on fifth day of illness. Papulo-vesicular stage. No œdema of face.
(b) Photo taken on ninth day of illness. Vesiculo-pustular stage. Face puffy.

(4) Season.

There are two distinct seasons in Trinidad, the wet and the dry. Approximately the dry season extends from January to May, and the wet from May to December; there is usually a spell of dry weather in

September or October, which lasts two or three weeks, and is commonly known as the "Indian summer."

The disease made its appearance in April, 1902, and showed no tendency to spread during the rainy season; it was only in January, that is, at the commencement of the dry season, that it began to assume epidemic form, and it continued to increase until it reached its maximum height in May, when the onset of the rains checked it. It then gradually declined until it finally disappeared—from the town in November, 1903, and from the country districts in January, 1904. The seasonal prevalence of small-pox in the tropics has long ago been observed. As far back as the middle of the eighteenth century Holwell, in speaking of the ravages of small-pox in Bengal, thus refers to the periodicity of the disease and the influence of the seasons on it:—

Every seventh year, with scarcely any exception, the small-pox occurred in these provinces during the months of March, April and May, and sometimes prevailed until the annual returning rains about the middle of June put a stop to its fury [see Table VIII.].

INCUBATION.

The determination of the duration of this period was surrounded with some difficulty on account of the unreliability of the patients, who for the most part were ignorant, and also on account of other unavoidable sources of error; it may, however, be stated with a fair amount of accuracy that this period lasted ten to fourteen days, and this was borne out in a number of cases which afforded a decided opportunity for judging the precise time of incubation.

INVASION.

This period was hardly ever ushered in by rigors. Headache, backache, fever, and occasional vomiting or nausea appeared without any warning. Constipation was almost invariably the rule in adults, and giddiness was often complained of. This stage lasted from one to seven days, but in the majority of the cases it was of three days duration.

(1) *Headache*.—This was not a constant symptom and was not confined to any particular part of the head; it was usually general and its intensity varied very much.

(2) *Backache*.—This symptom was rarely absent. Sometimes it was very slight, but in most of the cases it was severe, and in a few instances it was described as being very violent. In pregnant women it was frequently mistaken for labour pains, so that many of the cases were

admitted to the maternity ward, where the nature of their complaint became at once apparent.

(3) *Fever*.—The fever developed usually without any preliminary chill, at least its presence was almost invariably denied; in children it was often ushered in by convulsions. The usual conditions associated with pyrexia were present, viz., general malaise, anorexia, thirst, furred tongue, quick pulse and disturbed sleep. The temperature rose rapidly,



FIG. 4.

M. R., female, aged 28; unvaccinated. Photo taken on seventh day of disease. Vaccinated on February 25. Developed initial symptoms of small-pox same evening. Three vaccine vesicles on left forearm and variolous rash general.

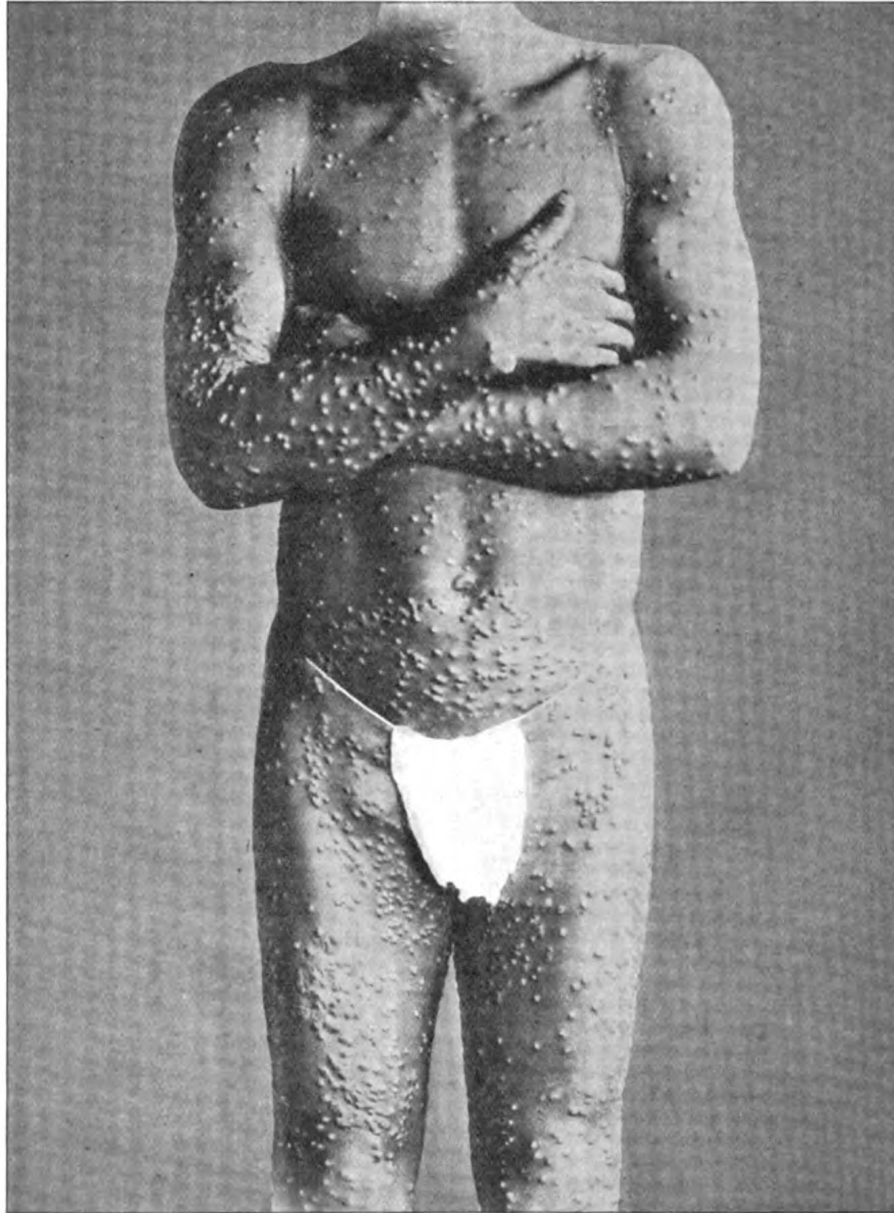


FIG. 5 (a).

E. S., male, aged 22; unvaccinated. Photo taken on tenth day of disease.

Front view. Large hemispherical pustules on front of thorax, abdomen, upper extremities and thighs; some of the pustules on trunk and limbs umbilicated. Gland in groin enlarged.

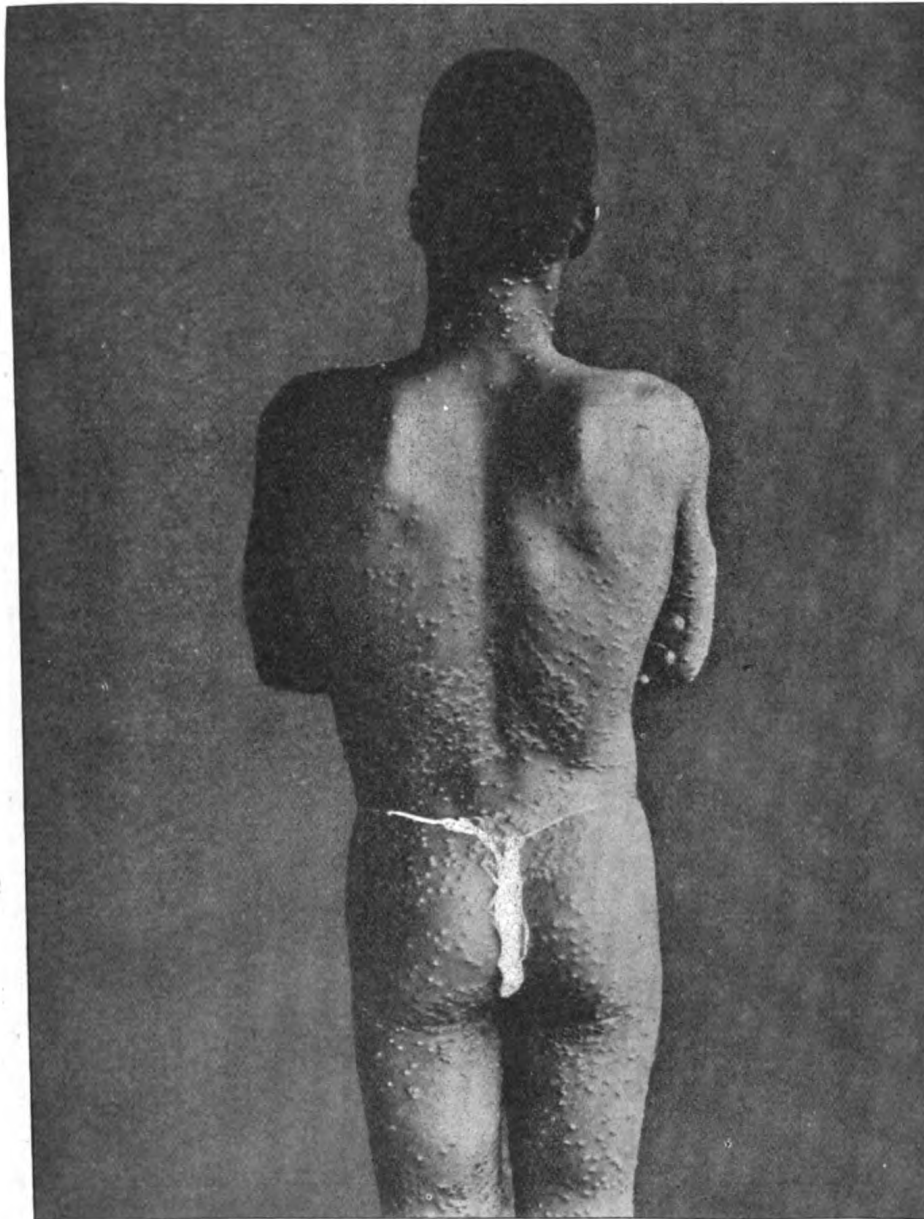


FIG. 5 (b).

E. S., male, aged 22 ; unvaccinated. Photo taken on tenth day of disease.

Back view. Shows arrangement of pustules in and around ringworm patches on the back.

and within twelve to twenty-four hours of the commencement of initial symptoms it was at its maximum height, reaching from 102° F. to 105° F. even in the abortive cases. The fever persisted with slight morning remissions as a rule during this period. Previous vaccination did not seem to influence the temperature at this stage. On the appearance of the rash it fell suddenly to normal or subnormal in the mild or abortive cases; in the severe, discrete and confluent forms defervescence was gradual, but in the latter the temperature seldom dropped to normal.

(4) *Vomiting*.—This was not a constant symptom, but it was observed in a large number of cases and was of short duration; in some instances it was, however, very distressing and persistent, causing much exhaustion. In four of my cases it ceased only when the eruptive stage was already far advanced.

(5) *Nausea*.—This occurred in a fair proportion of the cases.

(6) *Constipation* was almost invariably the rule in adults, whilst in children the opposite condition often obtained.

(7) *Vertigo*.—This was frequently complained of; most patients in this stage reeled from side to side whenever they attempted to assume the erect posture.

(8) Violent pulsation of the carotids was often observed at this period. There was no relation between the intensity of the initial symptoms and the severity of the disease, nor was there any relation between the duration of this period and the abundance of the rash. Indeed, a severe invasion period was sometimes followed by a very sparse and insignificant eruption; similarly, a long invasion period sometimes ended in a very mild attack. In infants the initial symptoms were, as a rule, so mild that the disease was often recognized only in the eruptive stage.

INITIAL RASHES.

No preliminary rashes occurred, as far as I could ascertain, in any of the cases that came under my care in the isolation ward. In one case a rubeoloid erythematous rash appeared on the front of the thorax of a boy during the desiccation period of the disease; it was at first very faint, then deepened in hue and gradually faded away, leaving no marks behind it.

ERUPTIVE PERIOD.

On the appearance of the rash all the initial symptoms of the disease subsided more or less, according to the abundance of the eruption. A sense of entire relief was experienced on the first day of the eruption in

the abortive and most of the mild cases, but in the severe discrete cases this took place somewhat later, whilst in the confluent variety, owing to the painful phenomena of the eruption on the mucous membrane and of suppuration, it hardly occurred at all. The same remarks hold good as regards the temperature. In the abortive and mild cases the fever subsided at once to normal or subnormal on the appearance of the rash; in the severe discrete form this was generally accomplished only after twenty-four to seventy-two hours, owing to crops of eruption, so that there was a short intermission before the onset of the secondary fever. In the confluent cases, although defervescence took place, it did not coincide with the beginning of the eruption; it was slow and the



FIG. 6.

A. B., female, aged 19; unvaccinated. Photo taken on tenth and eleventh day of disease. Face puffy. Scabbing had commenced on face. Eruption was very thick on face and upper extremities, sparse on chest except on breasts, especially around the nipples. Pustules on forearms large and bullous. Did not die.

temperature rarely fell to normal, consequently there was only a remission, which was of short duration owing to the early commencement of the secondary fever. In some of the severe discrete cases there was no intermission, but only a remission of temperature; whilst in some confluent cases there was no intermission between the primary and the secondary fever, the one form merging into the other.

Generally on the fourth morning of the illness small papules appeared on the forehead and face, then on the backs of the hands and about the wrists; the eruption gradually extended to the arm, trunk and lower extremities. The rash on the face was often shotty and usually a day in advance of that on the trunk, and two or three days in advance of that on the thighs, whilst the legs and feet became affected at a still later period. During the first two or three days, especially in the severe discrete and confluent cases, fresh papules kept appearing, even on those parts which were more or less thickly covered. This probably accounts for the slow and gradual fall of temperature. These secondary papules as a rule remained small, and shrivelled up rapidly, especially in the vaccinated.

In the great majority of instances the rash first appeared on the face, the next most common site being the dorsum of the hands, a fact which I observed in 9·2 per cent. of my cases. Of eleven cases in which the rash first appeared on sites other than the face or hands, the back, forearms, thighs and buttocks each furnished two instances, and the scrotum, penis and feet one each.

The papules gradually enlarged and became hard and resistant to pressure, and in about twenty-four to thirty-six hours they were transformed into vesicles; this change was observed to take place sometimes even earlier than this. The vesicles were multilocular and their contents were expressed only with great difficulty. Those on the trunk and limbs were sometimes umbilicated (*see* for example figs. 5, 9, 10 and 11). The vesicles increased in size until about the sixth day of the disease, when they became surrounded by an inflammatory areola which appeared red or black, according as the colour of the patient's skin was white or black. The contents of the vesicles began to become turbid and the central depression to disappear at about this time. Vesicles of unequal sizes were not unfrequently seen side by side on the same parts. On the seventh or eighth day of the disease the vesicles on the face were fully converted into pustules, and this transformation gradually extended to those on the trunk and limbs. In abortive cases, whether occurring in vaccinated or unvaccinated persons, the papules shrivelled up before reaching the vesicular stage, and in the instances where the papules had become vesicles desiccation took place soon after, before pustulation had occurred. The disease ran a similar course in a few of the mild discrete cases.

The rash was generally very abundant on the face, back of hands and forearms, dorsum of feet, buttocks and thighs. Frequently the back

was markedly involved (figs. 9 and 19). The front of the thorax and abdomen were often remarkably free from eruption (figs. 6, 7, 8, 10, 11 and 12), even in the severe cases; the palms of the hands and the soles of the feet were invariably affected (figs. 1, 4, 9, 10, 14, 15, 19), even in the mild cases. In a large proportion the scalp, ears, scrotum, penis and vulva were invaded, especially in the confluent and severe discrete varieties. The mucous membrane of the lips, palate, fauces, uvula, pharynx, conjunctivæ, nostrils and meatus urinarius were not unfrequently implicated in the severe cases and occasionally in the mild discrete ones.



FIG. 7.

B. A., female, aged 39; unvaccinated. Photo taken on eleventh day of disease. Edema on face had begun to subside; crusting on face. Pustules on trunk and upper arms, bursting here and there, leaving crater-like depressions in their centre—"pseudo-umbilication"; large hemispherical pustules on hands and forearms. Eruption more copious on face and upper extremities than on chest and abdomen (copious eruption on lower limbs).

Special symptoms depended on the mucous membrane affected. Thus sore throat was often complained of. The vesicles on the mucous membrane were smaller, and they matured earlier than those on the cutaneous surface; they were white in appearance; in one case, where they were not confluent, on the palate a dirty membrane was formed simulating that of diphtheria. Again, these vesicles did not mature and scab as on the outer skin, from being constantly kept moist by secretion; for the same reason the eruption on the fœtus at birth presented a similar appearance.

The presence of the eruption on irritated surfaces was well illustrated in the case of an old man who had worn a truss for many years. The eruption followed closely the part that had been chafed by the truss, and formed a girdle round the waist. Where ringworm was coexistent with the "pox" the vesicles formed a distinct chain along the margin of the patches (fig. 5). In the case of ulcers the same ring-like arrangement was observed, and in all these situations the vesicles were larger and more advanced in development than those on other parts of the body. There was a distinct "shotty" feel of the papules, especially on the forehead, in many cases. The resisting power of the vesicles and pustules showed that they were invested with more than the mere cuticle of the skin; moreover, pitting, which resulted in a fair proportion of the cases, indicated the depth of the lesion. The bullous or pemphigoid character of the eruption on the limbs, more especially on the forearms and legs, was remarkable, and was observed in the confluent cases and in a few of the severe discrete variety (fig. 6). The bullæ closely resembled the blebs of scalds or superficial burns; their contents were dark, watery and very offensive; the temperature was septic in character. Such cases may be called "*variola pemphigoides*." I may here remark that the odour emitted from the cases generally was very slight, except in those referred to above. The fully developed pustules were more or less of the same size in all the cases, but there was always a variation according to the part affected in each case. The pustules on the face were invariably smaller than those on the trunk, and those on the trunk smaller than those on the limbs. The largest pustules were situated on the backs of the hands and the dorsum of the feet; these were generally about 5 mm. in diameter when fully matured (figs. 5 to 10). In a few instances the pustules were remarkably large everywhere. In the confluent form the rash on the face was small and fine, whilst large bullæ were invariably present on the limbs.

MATURATION.

This process could hardly be said to occur in all the cases, even in what seemed to be severe attacks of the disease; it began in the vesicles which had appeared first—that is, on the face—on or about the sixth day of the disease, and gradually extended to those on the trunk and limbs in the order of their appearance. The areola which had begun to form around the vesicles on about the sixth day became more extensive and inflamed on the trunk and limbs; umbilication when present began to disappear, and the pustules became hemispherical and unilocular, especially on the limbs, on about the tenth to twelfth day (figs. 5 to 19). On



FIG. 8.

P. W., female, aged 13; unvaccinated. Photo taken on eleventh day of illness. Edema of face had not disappeared altogether; crusting on face. Pustules on arms bursting and leaving pseudo-umbilication; pustules on hands and forearms large, hemispherical and unruptured. Eruption sparse on chest.

pricking them their walls collapsed and the fluid which escaped was in some cases, even at this late stage, clear, but on pressure upon them this clear fluid was followed by sero-purulent exudation containing some solid debris. The face was generally puffy at the commencement of the maturation period, especially about the eyelids and lips, in severe cases

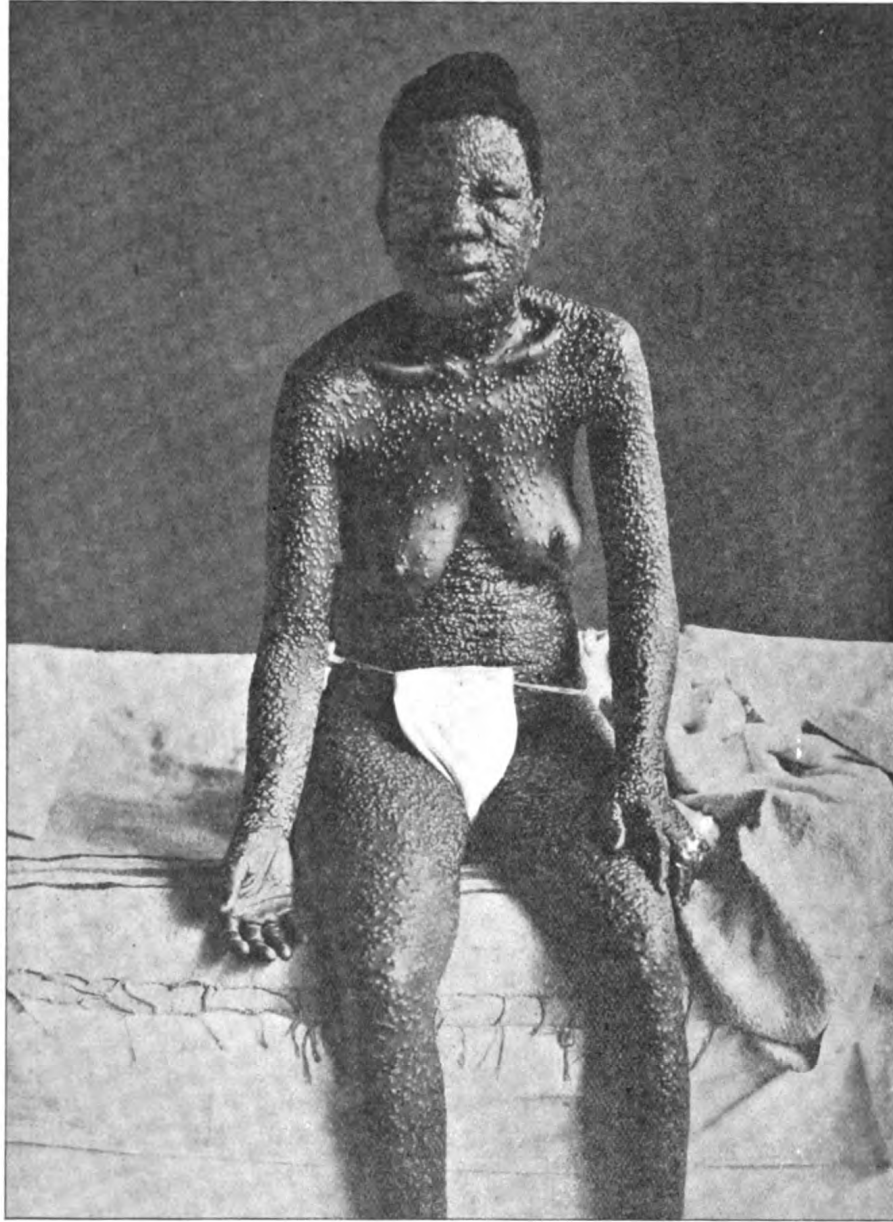


FIG. 9 (a).

V. B., female, aged 23; unvaccinated. Photo taken on eleventh day of disease.

Front view. Edema of face, especially about the eyelids and lips. Eruption confluent on face. Some vesiculo-pustules on trunk and limbs, umbilicated.

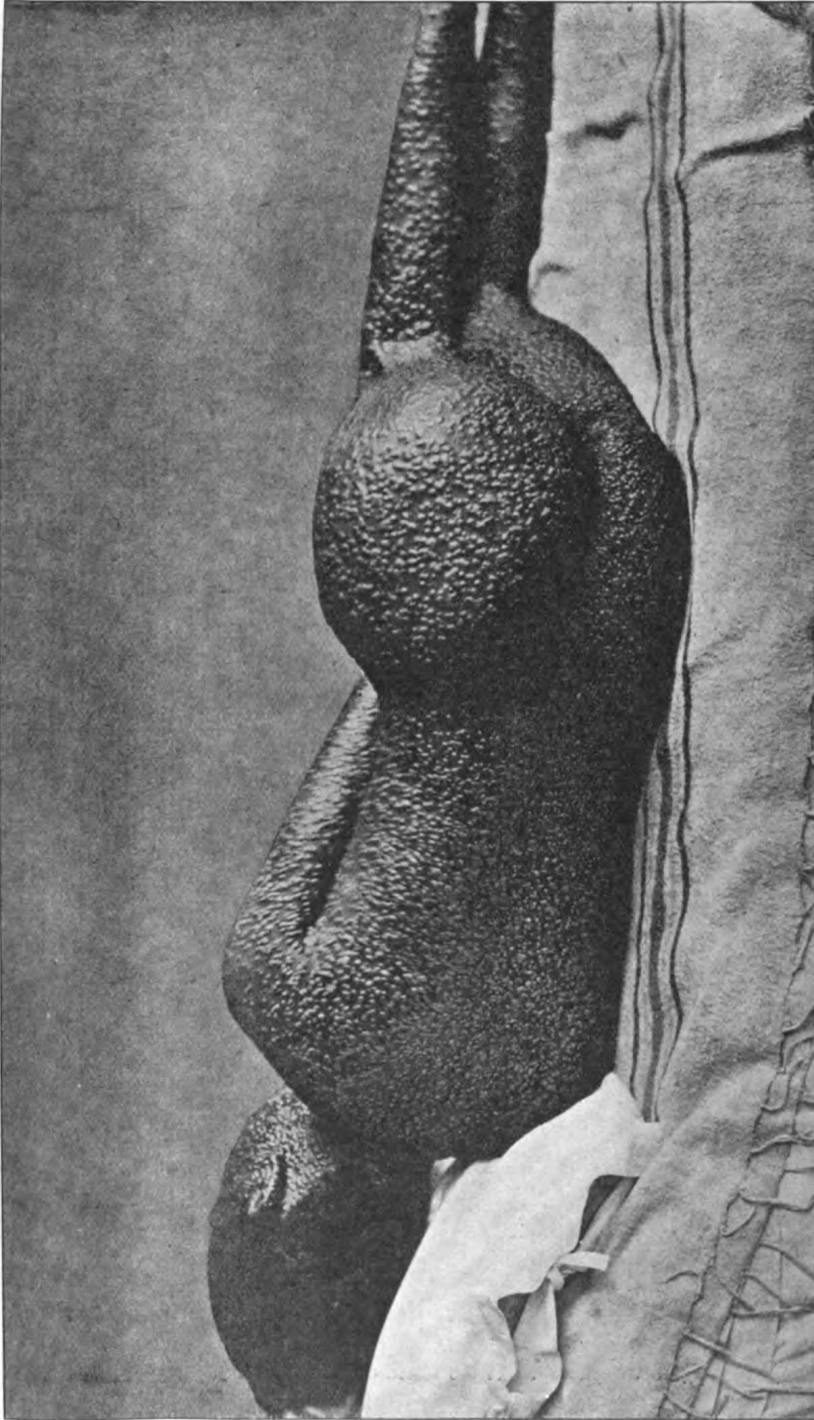


FIG. 9 (b).

V. B., female, aged 23; unvaccinated. Photo taken on eleventh day of disease. Back view. Eruption very thick. Some vesiculo-pustules umbilicated; most of the pustules had lost their central depression and had become fully hemispherical. This patient was discharged well.

(figs. 3, 6 to 9, and 11). The facial œdema increased as the lesions matured, only subsiding when scabbing commenced. On about the twelfth to the fourteenth day the feet and legs sometimes became œdematous, and less frequently the hands and forearms (fig. 11). These swellings always caused considerable pain and discomfort, and so caused insomnia.

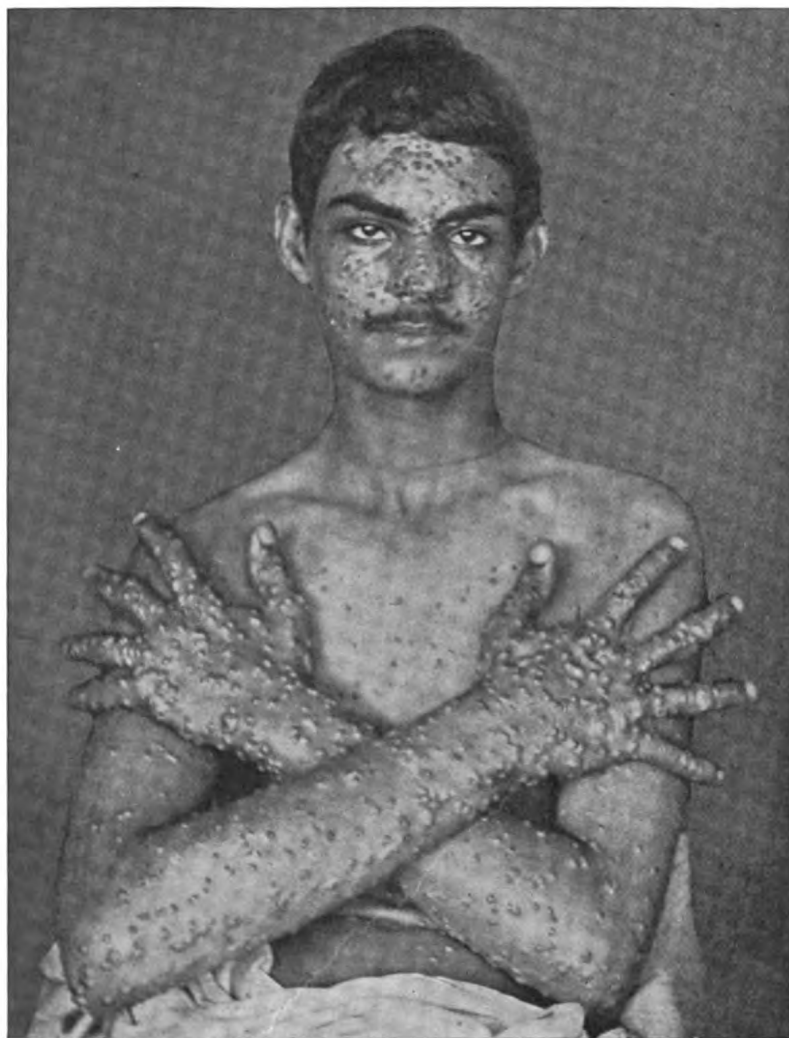


FIG. 10 (a).

J. de F., male, aged 20; unvaccinated. Photo taken on about eleventh day of disease.

Eruption copious on face and hands, sparse on front of thorax and abdomen.

Secondary fever was absent in the abortive attacks and also sometimes in the mild discrete cases, and when present in these its intensity and duration varied very much. As a rule, there was little



FIG. 10 (b).

J. de F., male, aged 20; unvaccinated. Photo taken on about eleventh day of disease. Large hemispherical pustules on forearms, hands (including palms), legs and feet (including soles). Some pustules on the backs of the hands are umbilicated.



FIG. 11.

(a) H. F., female, aged 30; unvaccinated. Photo taken on twenty-fourth day of disease. Edema of legs was subsiding. Pustules had burst everywhere and were drying up, leaving crater-like depressions in their centre, except a few on the insteps, which were desiccating without rupturing.

(b) H., female, aged 6 weeks; unvaccinated. Photo taken on fourteenth day of disease. Face and limbs thickly covered with desiccating pustules, very few on trunk. Face oedematous; crusts on face. A few pustules on insteps drying up without rupturing.

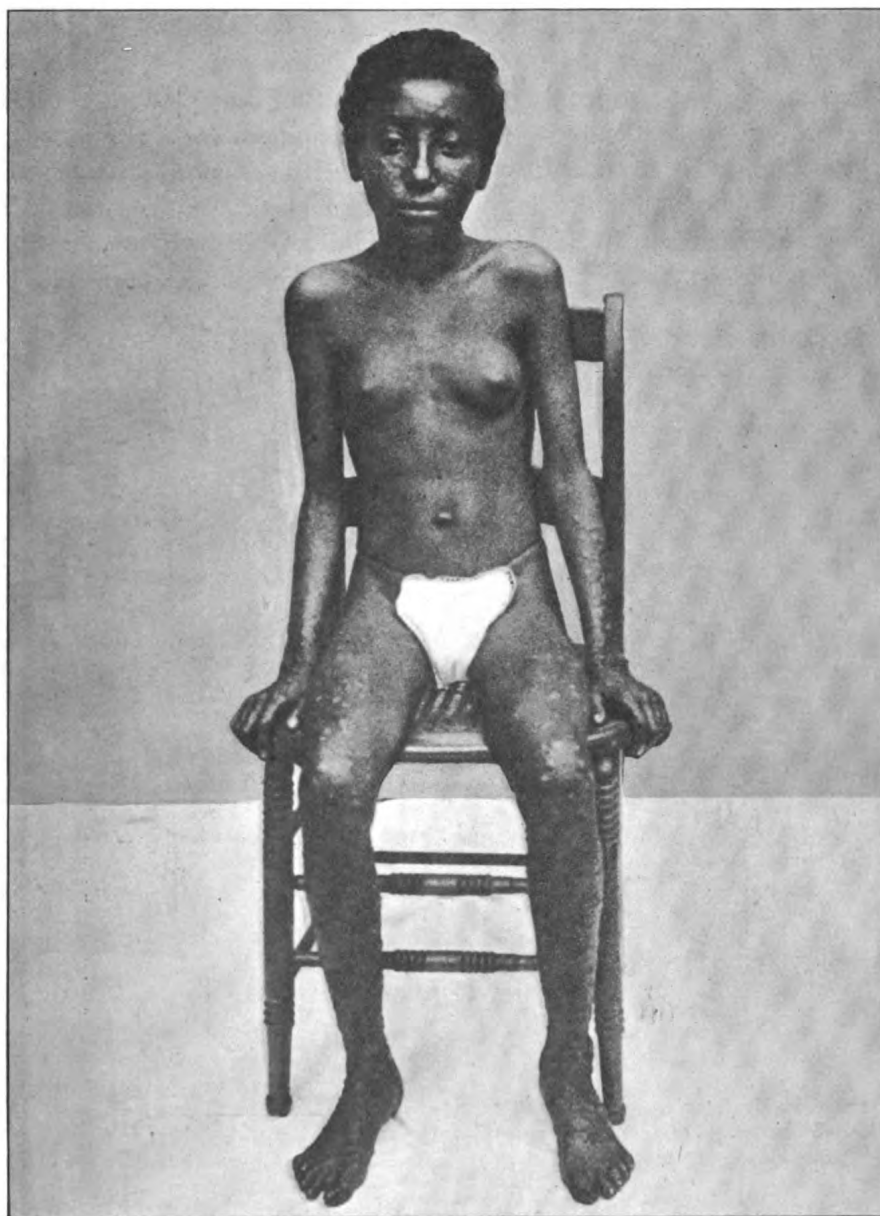


FIG. 12.

T. P., female, aged 12; unvaccinated. Photo taken on about sixteenth day of disease. Drying pustules on face and limbs, none on trunk. Scabs had nearly all fallen off face. Pustules on forearms and thighs had begun to burst; those on hands, legs, and feet had not yet ruptured.

constitutional disturbance at this period of the disease. In the severe discrete and confluent varieties the secondary fever was generally severe, but its severity was not commensurate with the abundance of the lesions. In a few instances, however, the secondary fever was very severe and prolonged. It began with the process of maturation, and its duration and severity depended more or less upon the abundance of the pustules; it lasted five or six days, but was not as high as that of the primary fever. The morning remissions were well marked. At this period of the disease, in the severe cases, all the painful and distressing symptoms of the prodromal stage returned, and to them were added pain all over



FIG. 13.

B. H., female, aged 33; unvaccinated. Photo taken on fifteenth day of disease. All œdema of face had subsided; some crusts still on face. Pustules on front of thorax and arms had burst and were drying up; those on the forearms, hands, and knees were hemispherical; some of them had ruptured.

the body due to the tumefaction of the skin, especially on the face, hands and feet, and discomfort in the throat and other mucous membranes where the vesicles appeared. Even in these cases there was,

generally speaking, little depression, and the constitutional symptoms were mild in comparison with the abundance of the rash. In most of the cases the patients were able to walk about and appeared cheerful. The only inconvenience experienced by them was the pain caused by pressure on the pocks in the soles of the feet whilst walking. In a few cases, however, there was great prostration usually associated with fever of a septic nature.

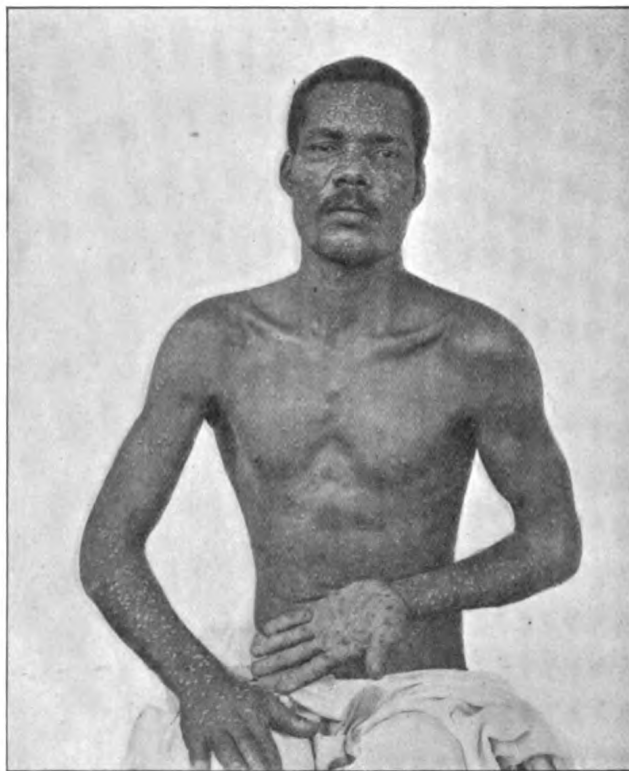


FIG. 14.

E. S., male, aged 28; unvaccinated. Photo taken on nineteenth day of disease. Warty elevations on face left after scabs had fallen off. Pustules over trunk and arms were drying up; nearly all pustules on forearms and back of hands had ruptured, those on palms unruptured; contents becoming inspissated.

Secondary fever in small-pox is generally attributed to the absorption of pus into the system from the foci of suppuration in the skin during the maturation of the pocks. If this were the sole cause of the fever, it would have been more severe and fatal, considering the extensive area

of cutaneous surface involved in many of the cases that came under my care. In some instances there was hardly any healthy skin left, and yet the temperature did not rise beyond 102° F. It is also noteworthy that "cutaneous asphyxia" did not ensue in these severe cases.

Another theory regarding the cause of maturation fever assigns the pyrexia to the absorption into the blood of the decomposed discharge from the pustules. If this were so one would expect the fever to be more or less within control, but in spite of great cleanliness and the frequent use of antiseptic baths the temperature was not checked; moreover, secondary fever begins before the rupture of the pustules and terminates before they are dry. There seems, therefore, to be some

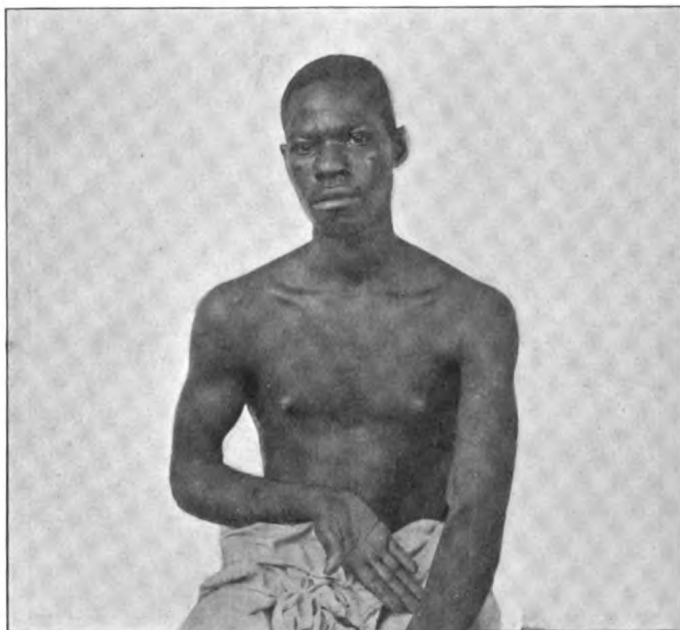


FIG. 15.

R. C., male, aged 20; unvaccinated. Photo taken thirty-one days after commencement of attack. Face pitted. Macules on front of thorax and upper extremities, including palms.

other agency at work causing the rise of temperature. It may be that a specific variolous poison is evolved in the pustules and that it produces this so-called maturation fever. The comparative mildness of the fever in this epidemic could be better explained in this way, namely, on the

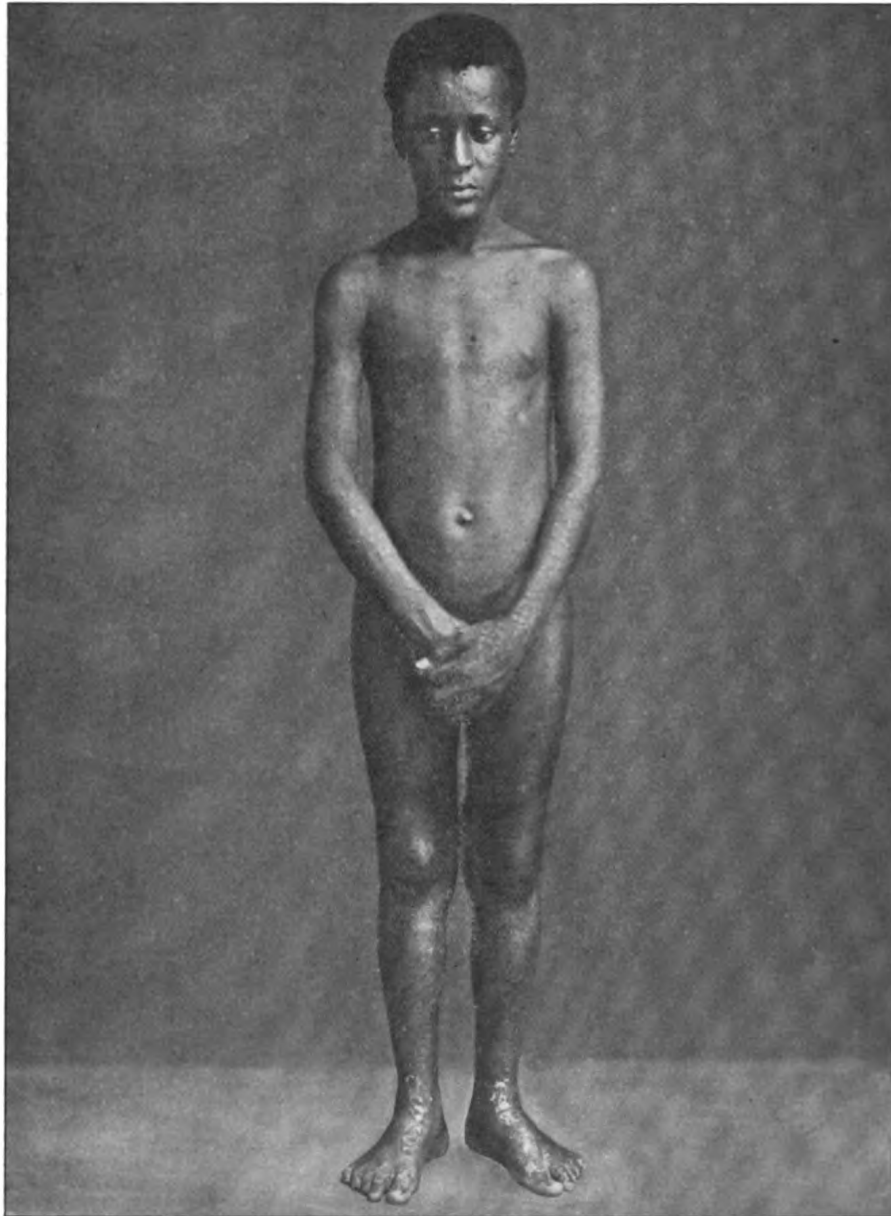


FIG. 16.

C. G., male, aged 13; unvaccinated. Photo taken forty-two days after commencement of attack. Face pitted. Macules on trunk and limbs, centre light-coloured, periphery dark.

presumption that the poison was less virulent than that which is produced in the pustules of small-pox of the ordinary type.

DESICCATION.

This process began early on the face, usually on about the eighth or ninth day of the disease; the pustules burst and the exudation from

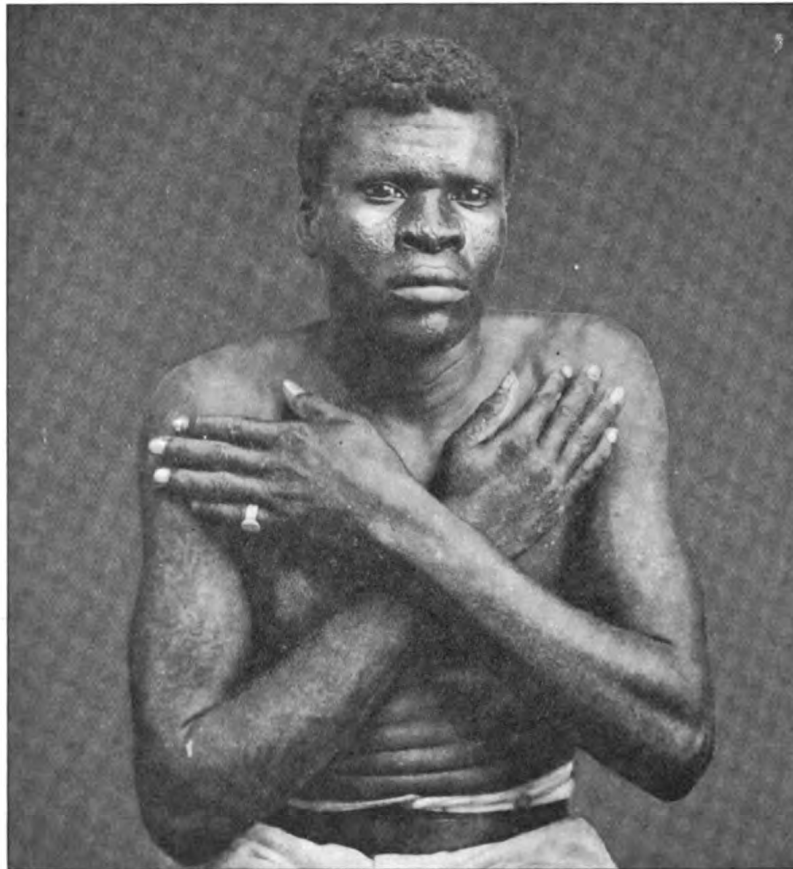


FIG. 17.

G. S., male, aged 27; unvaccinated. Photo taken sixty-four days after commencement of disease. Face pitted. Macules on trunk and upper extremities.

them caked and formed moist yellow crusts. As scabbing commenced the œdema of the face began to subside. In only two cases did the pustules on the face dry up without first bursting. When the crusts

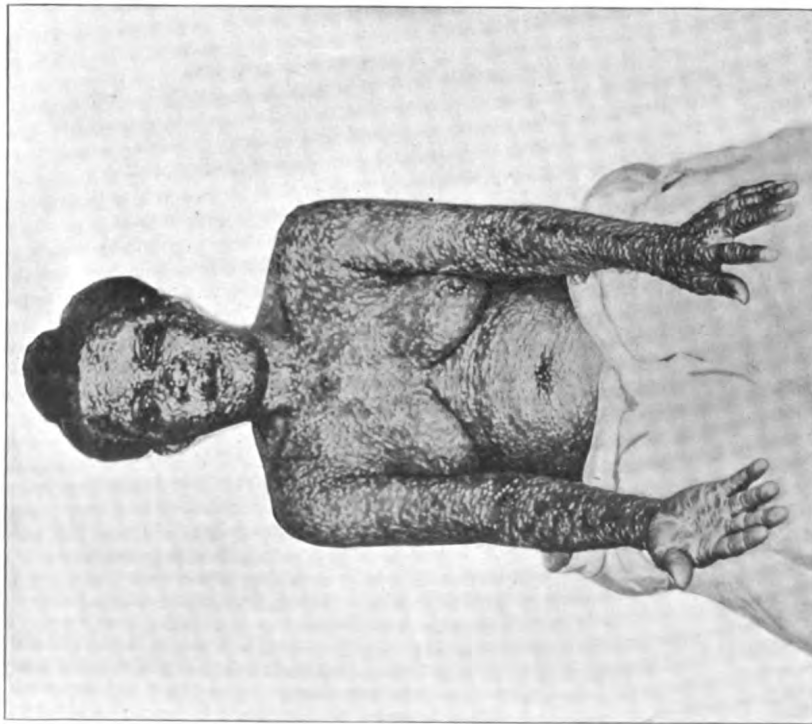
dried up and the scabs fell off on about the eleventh or twelfth day, the solid bases of the pocks remained as warty elevations on the face (fig. 14). Little by little these small pink excrescences, which were probably due to the persistent tumefaction of the papillary layer of the skin, disappeared by absorption, and in about two weeks they were replaced by macules on a level with the skin, varying in hue, but usually pink in the centre and dark at the periphery. In many cases further absorption took place until actual pitting occurred (figs. 15 to 18 and 19). This peculiar condition, so-called wart-pox, was characteristic of this epidemic and was



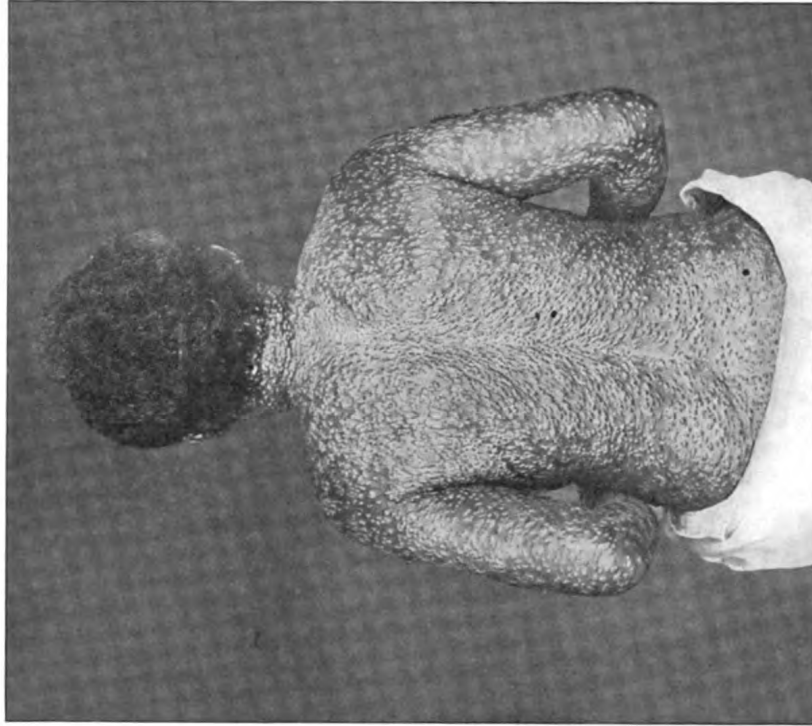
FIG. 18.

R. G., male, aged 30; unvaccinated. Photo taken seventy-four days after commencement of disease. Face pitted.

almost invariably present, even in the mild cases. It was confined to the face. In only three instances did I observe similar excrescences on the extensor surface of the forearms, and only once on the legs. Pitting occurred in one or two cases after the shedding of the scabs, notably in a recurrent case, without the process of absorption referred to above taking place.



(a)



(b)

FIG. 19.

M. G., female, aged 48; unvaccinated. Photo taken on about the tenth to the twelfth day of disease.

(a) Pustules thick on face, front of chest, and upper extremities. (b) Copious eruption on back. Some of the pustules still umbilicated.

About twenty-four or thirty-six hours after the commencement of the desiccation of the pustules on the face, the same process occurred on the trunk and arms, then on the forearms and thighs, and later on the legs. The pustules on the dorsum of the hands and feet were very resistant, owing to the thickened epidermis on these parts. After the rupture of those on the trunk and limbs, and the escape of their contents, small crater-like depressions were left at the bottom of the pocks (figs. 7, 8 and 11). Occasionally, the pustules on the trunk and limbs dried up

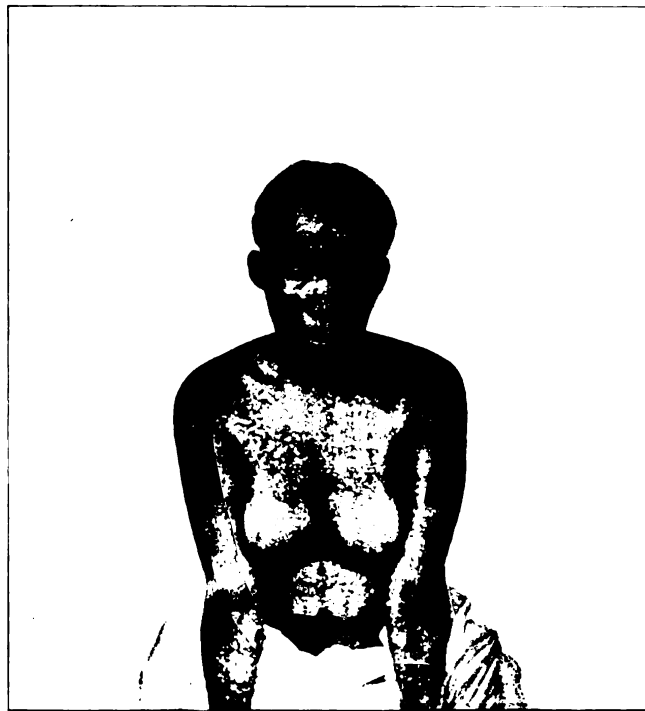


FIG. 19 (c).

M. G., female, aged 48; unvaccinated. Photo taken two weeks after complete recovery. Face pitted. Macules on chest and arms, centre light-coloured and periphery dark.

without rupturing and formed brownish circular crusts, which on falling off left a pink pale base gradually becoming lighter in colour and eventually fading away. The pustules on the palms and soles never ruptured spontaneously; their contents became inspissated and were absorbed; the superimposed epidermis was shed later on.

As the pustules began to burst, the areola around them faded away.

The face was the first part to clear up. The same order of succession was maintained in the desiccation of the eruption as that in which it originally appeared. Desiccation was rapid on the face, trunk and upper part of the limbs, but very slow on the forearms, hands, legs and feet, even in the mild cases. After the scabs had fallen off the trunk and limbs circular macules were left on a level with the skin, having a dark, pigmented periphery encircling a light coloured or pinkish centre (figs. 15 to 17 and 19). These marks persisted for a considerable time and then gradually disappeared after several months. During desiccation itching was often a distressing symptom. The duration of this stage varied very much, as it was dependent more or less on the severity of the attack, but in many of the mild cases the process was long and tedious on the hands and feet.

CONVALESCENCE.

Convalescence was short and rapid in the mild cases, whilst in the severe discrete and confluent forms, especially when complications arose, it was sometimes much prolonged; in the majority of the cases it was uninterrupted. Hardly any emaciation resulted except in a few instances. The patients usually developed a voracious appetite as soon as scabbing commenced on the face.

The average duration of the disease in the 564 cases I had charge of was 28·43 days; this is, however, below the mark, for unfortunately at the beginning of the epidemic many cases were discharged before they could be considered "cured," owing to the want of accommodation. The shortest cases lasted seven days; this occurred in three instances where vaccination performed during the incubation period of the disease caused its abortion. The longest case remained eighty-three days in hospital, but its detention for such a long period was due to complications and sequelæ.

TREATMENT.

This resolved itself mainly into questions of scrupulous cleanliness and judicious diet. In the initial stage of the disease calomel, followed by a saline purge or castor-oil, was administered; a diaphoretic mixture was then given until the rash appeared. During the eruptive stage carbolic acid or Fowler's solution was tried in several cases at first, but as no real benefit seemed to accrue from the use of these drugs they were discontinued. Arsenic, which has been lauded in the treatment of small-pox by some writers, proved positively harmful in some of my cases, as it caused much intestinal irritation which was difficult to allay. Internal

medication was abandoned during the eruptive and desiccation stages except in special cases, where the use of digitalis, ether, strychnine, and other drugs was indicated. Cinchona proved very beneficial in the desquamating stage, especially where malaria was a complication. Mild preparations of iron gave good results in the anæmic cases. Opiates relieved pain and irritation, and induced sleep when most of the other hypnotics failed.

External Applications.—Tepid antiseptic baths, especially Condyl's fluid properly diluted, were used from the first in almost every case, much to the comfort and relief of the patients. These baths were continued until desquamation was quite complete. Boric acid or zinc ointment and carbolyzed vaseline or cocoanut oil were largely employed, but the application of guaiacol in olive or cocoanut oil (1 in 80) gave the best results; it relieved itching promptly and appeared to hasten the desiccation of the pustules. This drug has been recommended by Dr. J. J. Ridge in the *British Medical Journal* of May 30, 1903.

In complications the remedies used were simply those for the disorders occurring in uncomplicated states. The wards were well ventilated, and although there was at times some overcrowding the death-rate did not seem to be affected thereby, as it invariably is in the case of small-pox of a virulent type.

Diet.—During the invasion and early eruptive stages of the disease there was, as in all febrile disorders, anorexia, and only liquid nourishment could be taken. As soon as the eruption had fully appeared the appetite was restored and a liberal diet was allowed. At the onset of the secondary fever the appetite was again impaired, necessitating a return to low diet, but as scabbing commenced on the face the patient clamoured for food. In the abortive and mild cases, where there was no secondary fever, the appetite was impaired only during the invasion period. Stimulants were given in the few instances where their use was indicated; alcohol proved very beneficial in the old and debilitated.

COMPLICATIONS.

Complications occurred in all stages of the disease and were in some instances of a grave character.

(A) *In the Invasion, or Early Eruptive Stage.*

(1) Respiratory system:—

(a) Dyspnoea occurred in five cases; in one of them it was accompanied with much pain in the chest; this condition was very

distressing while it lasted, but in every case except one, where there was hæmorrhage into the lungs, it subsided on the appearance of the rash. In the other cases I was unable to detect any pulmonary or cardiac lesion to account for it.

(b) Hæmoptysis occurred in the hæmorrhagic case just referred to, which was the only one of this type that occurred during the epidemic.

(2) Nervous system :—

(a) Delirium was observed in five cases, in two of which the disease ran a mild course, whilst in the other three cases the attack was severe, and in two of them motor aphasia was also present. Delirium was more marked at night than during the day; it disappeared altogether as the eruptive stage was reached; in one case, however, it lasted ten days.

(b) Convulsions occurred in three female adults, two of whom had undoubtedly an hysterical tendency, whilst the third was an epileptic. In children it usually ushered in the initial symptoms of the disease and was often attributed at first to worms or dentition. This condition was of short duration and was never an alarming symptom at this stage.

(c) Aphasia, which sometimes occurs in acute disease, and is generally considered to be due to the toxins engendered by the specific bacilli operating upon the cells of the cerebral cortex concerned in the production of articulate speech, occurred in two cases, in both of which there was also delirium during the invasion and early eruptive stage. Both patients, after the cessation of delirium, were able to understand spoken and written speech and to translate their thoughts in writing, but the power of articulation was lost, showing that the aphasia was purely motor. Although some improvement took place during convalescence the defect of speech was still marked, even after their discharge from hospital—one forty-eight and the other forty-three days after admission.

(3) Alimentary system :—

(a) Diarrhœa developed in only four cases and was not a serious accompaniment at this early stage, except in the case of an infant who was already in a debilitated state.

(b) Melæna and hæmatemesis occurred in the hæmorrhagic case to which I have already referred.

(4) Urinary system :—

(a) Albuminuria was present in 18·08 per cent. of my cases in the stage of invasion, and varied in amount and duration; it vanished in the majority of the cases as soon as the rash appeared and the temperature had fallen; sometimes it persisted for a considerable period, disappearing in some instances only at the end of six weeks from the commencement of the disease. In twenty-four cases albuminuria occurred in persons suffering from chronic Bright's disease, a very common malady in this Colony, probably due to malarial infection; in these the albuminuria, of course, persisted after all the symptoms of variola had disappeared.

(b) Hæmaturia occurred in the hæmorrhagic case.

(5) Reproductive system :—

The catamenia frequently appeared in this stage of the disease, in many instances prematurely, but sometimes the appearance at this stage was a mere coincidence. The period was often longer and the flow more copious and bloody than normally.

(B) In the Pustular and Desiccation Stages.

(1) Respiratory system :—

Apart from a few mild cases of bronchitis and one of catarrhal pneumonia there was marked freedom from complications.

(2) Nervous system :—

(a) Low muttering delirium occurred sometimes in the old and debilitated, and usually signalled a fatal termination of the attack.

(b) Paralysis of the bladder was met with in one case at the end of the desiccation stage.

(c) Peripheral neuritis was occasionally observed in this stage, but this condition was more in the nature of a sequela than of a complication.

(3) Alimentary system :—

(a) Diarrhœa occurred in twenty-two cases at this late stage; two adults succumbed to it. In children it was a frequent complication, but no deaths resulted from it.

(b) Salivation was observed in only one case; it began in the eruptive stage and persisted during the maturation of the pocks; there was not much enlargement or tenderness of the salivary

glands, nor was there any eruption in the mouth. I may mention that no medicine containing mercury in any form had been administered to this patient.

(c) Vomiting, which occurred in only one case at this period, was very persistent and difficult to check.

(4) Urinary system :—

Pyuria occurred in one case.

(5) Integumentary system :—

(a) Boils or small abscesses were by far the most frequent of all the complications; they occurred in 46 per cent. of the cases and developed during desquamation, usually in the axilla, or on the back, thighs, and buttocks, and kept on appearing for a considerable time in some cases. They varied in size from that of a pea to that of a walnut and caused little constitutional disturbance. In one case forty-two small abscesses formed on the back of the patient.

(b) Carbuncles occurred in two cases and produced severe general symptoms and also much exhaustion.

(c) Gangrene of the toes followed in a very anæmic and pregnant woman.

(d) Skin eruptions appeared in many instances at this stage, especially ecthyma, acne pustulosa, rupia, and pustular scabies.

(6) Reproductive system :—

(a) Orchitis occurred in thirteen cases, and was accompanied by effusion into the sac of the tunica vaginalis in six instances; the fluid was always turbid. Both testicles were affected in one case and in another an abscess formed.

(b) Ovaritis was diagnosed in two instances.

(7) Circulatory system :—

No complication could be assigned to this system except a case of phlebitis of the brachial vein.

(8) Locomotory system :—

Synovitis of the knee- and ankle-joints occurred in a few cases, but the effusion was never purulent and was rapidly absorbed.

(9) Lymphatic system :—

Enlargement of the inguinal glands, and more rarely of those in the neighbourhood of the elbow, was observed sometimes; the pain

was usually of short duration, but the swelling persisted for a long time.

(10) Organs of sense.

(i.) Eye:—

(a) Conjunctivitis was a rather frequent complication, especially in the maturation stage.

(b) Keratitis was also present in some of the severer cases, and was sometimes very rapid in its work of destruction.

(c) Panophthalmitis of the eye occurred in three patients; in one of them both eyes were destroyed.

(ii.) Ear:—

(a) Otorrhœa was observed in two cases, but yielded quickly to treatment.

(b) A mastoid abscess developed in one case.

Other Complications.

Malarial fever, which so often accompanies other disorders in the tropics, was observed in a few of the cases. Typhoid fever was a complication in one case.

SEQUELÆ.

(1) Respiratory system:—

Acute pulmonary tuberculosis developed in two cases, soon after desquamation was complete, and ran a very rapid course. This disease is common here, and sometimes ends fatally in a remarkably short time.

(2) Nervous system:—

(a) Peripheral neuritis was not an uncommon sequela of the disease; it affected usually the extremities.

(b) Myelitis occurred in one case.

(c) Insanity. A young woman who had just recovered from the disease developed acute mania.

(3) Urinary system:—

(a) Chronic nephritis appears to have developed in a woman during convalescence; she had small-pox when she was five or six months pregnant. Her urine was then free from albumin; it was again examined shortly before labour and found to be loaded with albumin; this persisted for three months, after which time I lost

my—9

sight of her. The persistent presence of albumin in the urine in this case points to some cause other than pregnancy; at any rate the albuminuria of pregnancy is, as a rule, temporary; it usually disappears after labour.

(4) Integumentary system:—

(a) Pitting showed itself in a considerable number of the severe and in a few of the mild cases; it was confined to the face and affected especially the forehead, cheeks and nose (figs. 15 to 19).

(b) Pigmentation. After the scabs had dropped off, macules were left with a pale pink centre and a dark pigmented periphery. These marks gradually faded away, and several months after recovery disappeared entirely (figs. 15 to 17, and 19).

(c) Alopecia. In two severe cases the hair dropped out completely, leaving the scalp bare during convalescence, but two or three months after recovery it grew again. This condition was observed also in an infant; in this case it was only partial, the anterior portion only of the scalp being affected.

(d) Shedding of the nails. In several of the severe cases the toe-nails were shed without any apparent sign of inflammation; this process was probably trophic in nature. The finger-nails were less frequently affected, and at a later period than the toe-nails. Regeneration of these epidermic appendages followed in two or three months.

(e) Exfoliation of the skin of the hands and feet was observed in four very severe cases. The skin of these parts was cast off entire, like a glove or a slipper.

INFLUENCE OF THE DISEASE ON PREGNANCY.

(A) *Cases admitted to the Isolation Ward.*

Thirty-eight pregnant women were admitted to the isolation ward in the invasion or early eruptive stage of the disease; twelve gave birth to, apparently, full-term healthy children at this stage. In these cases the onset of labour may possibly have been precipitated a few days by the initial fever or it may have been a mere coincidence in the regular course of pregnancy. Of the remaining twenty-six women who had not completed the full term of gestation, two gave birth to premature infants and one aborted. The further history of twenty of the remaining twenty-three, who were discharged cured of the disease, was traced.

Sixteen carried the foetus to term, three were confined prematurely, and one aborted. The age of the foetuses in the cases of interrupted gestation ranged from six to eight months, and the date of delivery with reference to the disease in the mother was four to twelve weeks after the commencement of prodromal symptoms.

(B) Cases admitted to the Maternity Ward.

Fifty-one women who had had the disease during pregnancy and had recovered from it were admitted to the maternity ward under my care. Thirty-one had reached the full period of gestation and were delivered of healthy children—one of the children showed evidence of having passed through the disease *in utero*; it exhibited the characteristic macules (fig. 2). Of the remaining twenty women, eleven aborted and nine were delivered prematurely.

It would appear that the disorder in the initial and early eruptive stage had little or no immediate effect upon pregnancy; gestation was usually interrupted in its course four to twelve weeks after the mother had developed the prodromal symptoms of the disease. This was due either to the death of the foetus, caused by an attack of the disease *in utero*, or to fatty degeneration of the placenta—a condition frequently observed in these cases. In the majority of instances pregnancy ran a normal and an uninterrupted course. I may here remark that potassium chlorate was administered to a pregnant case as soon as desquamation began and was continued until delivery, when a healthy child was born. The effect of the disease on the foetus has already been described.

VARIETIES

	VACCINATED					UNVACCINATED	GRAND TOTAL
	One mark	Two marks	Three marks	Four marks	Total		
(1) Abortive ...	6	6	3	5	20	21	41
(2) Mild discrete ...	21	30	4	3	58	258	316
(3) Severe discrete ...	14	6	1	2	23	165	188
(4) Confluent ...	2	—	—	—	2	16	18
(5) Hæmorrhagic ...	—	—	—	—	—	1	1
	43	42	8	10	103	461	564

The above table shows the large proportion of mild and abortive cases which occurred both in the vaccinated and unvaccinated. The proportion of mild to severe cases among those who were treated in their homes was even greater than is shown by this table, for as a rule only the worst cases were removed to hospital. These mild cases presented well-marked irregularities not only in the initial symptoms, but also in the evolution of the eruption. The main irregularities in the symptoms were:—

(1) The occasional absence of headache or backache and, in three instances, of fever.

(2) The almost entire absence of constitutional symptoms in many instances, these patients being able to pursue their daily labours without discomfort or inconvenience.

(3) The complete absence of secondary fever, or when present its extremely short duration, as a rule lasting only a few hours.

Irregularities in the evolution of the eruption showed themselves in the abortive development of the rash; the papules often shrivelled up before being transformed into vesicles, and even when the papules became vesicles these frequently desiccated without previous pustulation ("variola vesiculosa" [Thomas] or "variola varicelloides"). As these peculiarities occurred in such a large proportion of the cases, in the vaccinated as well as the unvaccinated, the epidemic may perhaps be considered to be the mildest which has yet been recorded. The anxiety and alarm usually apprehended in the more familiar form of the disease were conspicuously absent in the community during this epidemic.

Comparison of Vaccinated and Unvaccinated Cases in respect to liability of Attack.

Vaccination had a decided influence upon the disease; of the 564 cases that came under my care, 103 occurred in vaccinated, and 461 in unvaccinated persons. The patient's word as to the success of previous vaccination was not accepted without verification by careful examination of the scars. Among the vaccinated the proportion attacked was in an inverse ratio to the number of marks present. Thus forty-three cases occurred amongst those who showed one cicatrix, whilst there were only eight cases among those with three scars. The percentage of mild or abortive cases was greater in the vaccinated than in the unvaccinated, and no confluent or hæmorrhagic case was observed in the former class.

All the deaths—thirteen in number—occurred in unvaccinated subjects (*see* Table VI.). These facts indicate clearly the rôle played by vaccination in relation to the disease.

Observations on the incidence of the disease among the nursing staff afford a striking confirmation of the previously stated facts regarding its relation to vaccination. Thirty-six nurses, eight ward-maids and three ward-men were employed in the Isolation Hospital (*see* Table VII.). *Of the thirty-six nurses only three contracted the disease, and these three had never been vaccinated*; of the remaining thirty-three, seven, who were successfully vaccinated a week to four years previous to their joining the staff, escaped the contagion; of the remaining twenty-six, fifteen were successfully revaccinated one week to four years previous to their attendance on the small-pox patients and did not contract the disease. Of the remaining eleven five were revaccinated without success and were not attacked by the disease. Three of the remaining six were revaccinated after they had been ten, fifty-two, seventy-seven days, respectively, in the isolation wards, but only one of these reacted to the operation. One nurse had been vaccinated three times without success; another was vaccinated at the age of 12 successfully and suffered from an attack of small-pox the same week; in June, 1903, she was revaccinated with negative result; another, who had never been vaccinated, contracted the disease before she joined the staff.

As regards the eight ward-maids, the only one who was never vaccinated took the disease. Of the seven others two were vaccinated, four revaccinated successfully shortly before their services were engaged, and one was vaccinated in childhood and showed a very large cicatrix on the arm. Of the three male attendants who showed doubtful vaccination marks, one was successfully revaccinated a few days after he came into the ward; five days after this he developed the disease in an abortive form, vaccinia and variola running their course concurrently. Another was vaccinated three times with success and did not contract the disease, whilst the third had already contracted the disease before he was employed.

Reference has already been made to the immunity enjoyed by the East Indian population. The evidence, therefore, of the influence of vaccination upon the disease is strong, and is in conformity with the experience of all observers.

The following cases of the disease deserve separate notice on account of the special features which each presented.

Case I.—Hæmorrhagic Case.

B. L., a well-nourished and muscular negro, aged 30, unvaccinated, began to complain of general malaise on June 8, 1903, but was able to perform his usual work on that day. On the morning of June 9 he felt worse and took to bed; he then had fever and severe pain in the back; these symptoms, with the addition of headache from the 10th, continued unabated until the 12th, when he noticed what he described as prickly heat (*lichen tropicus*) on the hands and feet. On the appearance of this rash the general symptoms subsided. On June 11 his eyes had become very bloodshot; on June 13 he began to pass blood in his urine and to expectorate blood-stained sputum, and on the evening of that day his motions were observed to be black and tarry. He was admitted to the Isolation Hospital on June 14 at 4 p.m. in a very critical condition; his face was puffy and covered with an erythematous blush, but no distinct eruption could be detected. There was a purpuric rash on the trunk and limbs, which was rather abundant on the back of the hands and forearms and the dorsum of the feet and also on the back. The conjunctivæ were injected and the lips swollen and bleeding. On the palate was a pseudo-diphtheritic membrane. The tongue was coated with a thick dark fur. The sputum was blood-stained and dyspnœa was urgent. The patient's mind was perfectly clear. His pulse was small and quick, and his temperature at 5 p.m. 102° F., and at 8 p.m. 100.2° F. He had no sleep during the night, and experienced very great difficulty in swallowing even liquid nourishment, owing to pain and soreness in the throat. The vesicles on the limbs were observed on the morning of the 15th to contain dark-coloured blood. The temperature at 7 a.m. was 100.2° F. He expired at 9.45 a.m., and shortly before death vomited a large quantity of bright red blood.

Post-mortem Notes.—Well-nourished, tall, muscular negro. Petechial rash on face, trunk, and limbs. Petechiæ contained blood of a dark colour. The blood generally was dark and fluid. Lungs: both bases were congested; numerous hæmorrhages into the lung tissue; the right lung was bound down by old pleuritic adhesions. Heart: slightly hypertrophied, valves healthy; no hæmorrhages into its substance or into pericardial sac. Liver: congested; hæmorrhages into its substance; weight, 5 lb. 9 oz. Spleen: very congested, not enlarged, capsule thickened, substance firm. Kidneys: large, substance pale, in a state of fatty degeneration; hæmorrhages into the pelves and calices; right kidney weighed 9 oz., left kidney $10\frac{1}{2}$ oz. Bladder: contained bloody

urine, but the mucous membrane was pale and normal in appearance. Stomach: contained some blood-stained fluid; hæmorrhages into its mucous membrane. Larynx: intensely congested, of a purplish hue; well-marked vesicles on base of tongue, containing blood.

Case II.—Peculiar Form of Confluent Small-pox.

G. L., aged 42, unvaccinated, was admitted to the isolation ward on March 30, 1903, with the history of having had fever, headache, and backache, followed by an eruption which appeared first on the face and hands and then spread over the body generally. The date of the first appearance of symptoms could not be ascertained with precision, but, judging from the eruption, the patient, when first seen by me, was probably in the sixth or seventh day of the disease.

Condition on Admission.—A rather weak but fairly nourished woman with a very copious, vesicular eruption on the face, trunk, and extremities. The face was covered with large flat vesicles, having a dark central depression, but ill-defined edges; there was no subcutaneous œdema, not even of the eyelids; the skin presented the appearance of coarse parchment; the vesicles on the trunk were more or less of the same character as those on the face, but were larger and bleb-like in parts; those on the legs and dorsum of the feet and backs of the hands were still larger and more bullous; there were a few vesicles on the pharynx and palate; the tongue was coated with a yellow fur; the pulse was rapid and weak; temperature, 99·4° F.; the urine contained a trace of albumin and bile; the feet and legs were swollen; the mind was clouded and the patient was somewhat restless.

Progress of Case.—Prostration increased and the mind became more confused; large bullæ formed on the trunk and extremities; some of the vesicles on these parts much resembled vaccine vesicles, and the contents were serous and bright yellow in colour; the skin generally became jaundiced. Extensive areas of epidermis exfoliated, leaving raw surfaces on the chest and limbs, such as occur in superficial burns. The skin on the buttocks sloughed away *en masse*, and the patient succumbed on April 4, 1903.

Post-mortem Notes.—Body fairly nourished and covered with a vesiculo-pustular eruption, large and flat, containing bright yellow sero-purulent fluid. Large bullæ everywhere, formed by the coalescence of adjoining pustules; the contents of these were, for the most part, serous and bright yellow in colour. The superficial layer of the skin was

coming away from almost the entire surface of the body, and in some situations, especially on the buttocks, there were gangrenous ulcers. The feet were swollen. Liver: large, very soft and fatty. Spleen: slightly enlarged and soft. Gall-bladder: distended with thick, yellow bile. Heart: flabby. Kidneys: congested and fatty. This was the only case of the kind which came under my observation.

ATTACKS IN THE RECENTLY VACCINATED.

In their standard work on the theory and practice of hygiene, Drs. Notter and Horrocks remark that "much valuable evidence has been collected of late years in regard to the duration of the protection which vaccination gives against small-pox. This evidence indicates that although the susceptibility to the operation of vaccination returns comparatively soon after primary vaccination, the susceptibility to small-pox returns but slowly, so slowly, in fact, that the power of infantile vaccination against attack by small-pox may be said to remain at least to one-half of its original extent at 20 years of age." It is interesting, therefore, to note that, among the first 4,009 cases which were reported, the Assistant Medical Officer of Health had observed the disease in twenty-eight recently vaccinated and revaccinated persons; four cases had occurred within one year of vaccination; eight within three years, and four within four years, and eleven within from four to eight years. I also observed the disease in a young married woman, aged 18, who had been vaccinated four weeks previously and who showed three good recent vaccinia scars; in this instance the initial symptoms were severe, but the rash was sparse, although every part of the body, including the mucous membrane of the pharynx and tongue, was affected; the disease ran a rapid course; most of the vesicles shrivelled up, whilst a few became pustular. The next most recently vaccinated case which contracted the disease amongst those that were treated by me was a man who had been vaccinated four years before and who presented four good vaccinia cicatrices on his arm.

All experience goes to show that the duration of the protection afforded by vaccination is limited and is directly proportionate to the number and size of the vesicles produced, but it is very remarkable that this protection was so fleeting and transient as the above cases indicate. I do not think this unusual occurrence can be explained away by assuming that the vaccine lymph was not efficacious or that the diagnosis of small-pox was faulty, for the vaccinia marks were unmistakable and

the course of the disease typical of varioloid, at any rate in the case that came under my observation. Might the local manifestations of vaccinia have been produced in these instances without the absorption into the system of the immunizing substance which is supposed to be evolved in the growing vesicles? The fact that the disease was modified, at least in my case, is a proof that a certain degree of immunity was conferred.

Does the duration of immunity depend upon the nature of the lymph, the individual, or both? It is true that at certain seasons of the year, during the hot months, vaccine lymph suffers deterioration, but then such lymph would be inert and would produce no reaction. For the last seven or eight years glycerinated calf lymph has been used in this Colony; previous to this, vaccination was practised from arm to arm. The lymph which we now employ here is obtained from the Jenner Institute for Calf Lymph, and is kept in refrigerators until required for use. A fresh supply is received every fortnight, but the results are not always satisfactory. It would appear that the duration of the immunity afforded by vaccination depends to some extent on the potency of the lymph employed. Voigt, of Hamburg, in 1881, succeeded in inoculating a calf with human small-pox lymph and, after twenty removes in calves, used the lymph, in 1882, as a vaccine on children. In 1893, when the time came round for revaccination of the same children, the failures were more numerous than with children vaccinated in 1882 with ordinary lymph, showing greater potency of the Hamburg lymph (Edwardes). The strain of lymph therefore determines the duration of immunity. In my experience human lymph gives a greater reaction than calf lymph: the former often succeeds where the latter has failed. The vesicles are larger, and the resulting scars better marked and more persistent in those vaccinated with human lymph than in those vaccinated with calf lymph. It would appear, therefore, that the former is more potent than the latter. This may partly account for the occurrence of the disease in some of the recently vaccinated in whom glycerinated calf lymph was used. Idiosyncrasy or exceptional individual susceptibility to the contagion of the disease was probably also a factor.

SECOND ATTACKS.

The possibility of second attacks was recognized as far back as the tenth century by Rhazes, and his experience has been confirmed by many observers up to the present day. Dr. Edwardes, in his admirable and instructive book on "Small-pox and Vaccination," asks the question: "Can the same person have small-pox twice with an interval of some

years between the attacks?" and answers it in the affirmative. He adds, however, that such cases—fully established—are very rare, and that the frequency of such second attacks in former times is suspicious, because measles and various kinds of false small-pox were mistaken for variola. The following extract is taken from his book :—

Dr. Kubler, a high modern authority on the subject [of second attacks] says that the once survival of small-pox afforded, perhaps, no perfect protection but a strong resistance against a fresh attack.

The German Vaccination Commission of 1884 referred to this point. Dr. Koch said that second attacks were certainly rare; in the great epidemic of 1871—2, in 12,000 cases in South Germany no second attacks occurred. Dr. Reisner pointed out that, in old times, all second attacks appear to have occurred in children, never in adults; this pointed to error in diagnosis. Dr. Grossheim, who represented the army, had only met with one peculiar case out of 22,641 in military hospitals; a man had a slight form of variola three months after the first attack. Von Kerchensteiner (for Bavaria) had never heard of an early second attack, but he believed in the occurrence of second attacks, and he himself had seen a third attack. Professor Hebra, of Vienna, had treated the patient in the first two attacks; he died in the third. Dr. Kruger had seen one certain second attack in 500 cases of small-pox observed by himself. Dr. Thierfelder had never heard or seen a second attack. Dr. von Koch had met with two in Stuttgart, both fatal; in each case the second attack was many years after the first, "a long interval of time." Dr. Siegel stated that Wunderlich found twenty-two second attacks in 1,727 cases in Leipzig in 1781; six were fatal, and one of these six patients had had small-pox already in the same epidemic.

Dr. Friedberg, cited by Lotz, reported an extraordinary case from near Breslau, during the severe epidemic of 1871—2. A child had small-pox, and the attack left several cicatrices; the child was vaccinated successfully some months afterwards, and then contracted small-pox a second time, one month after the vaccine crusts had fallen, and the second attack was fatal.

Trousseau, in his book on clinical medicine, tells of a medical student who was three times attacked by small-pox; he also alludes to the death of Louis XV. from confluent small-pox fifty years after the first attack, which occurred when that monarch was aged 14.

Dr. Savill (Warrington epidemic, 1892—3) reports a woman, aged 30, vaccinated in infancy successfully, revaccinated in 1873, that is at the age of 10, contracted small-pox probably about the same time, and yet, twenty years afterwards, had a severe attack of confluent small-pox (April, 1893), which resulted in her face being badly pitted.

In the *Lancet*, August 1, 1903, Dr. Pierce records a case of recurrent varioloid rash following vaccination. He states that a boy, aged 15, whose primary vaccination took place when aged 10 and was said to

have been normal, was revaccinated on December 5, 1901, successfully; on December 24, that is, nineteen days after revaccination, small-pox showed itself, being ushered in by febrile excitement with increase of temperature, &c. The eruption developed fully and followed the normal course; the general symptoms were mild. On March 6, 1902, he developed three or four vesicles of large size about the upper lips and alæ of the nose, which were taken for herpes; the main part of the eruption appeared on March 7. A diagnosis of modified small-pox was made. In this three experienced medical men concurred. He further says that from the data available it was probable that the two attacks, whatever their nature, were identical. Even allowing that the attacks were dissimilar in character, one being, *e.g.*, varioloid and one a manifestation of vaccinia, the explanation of the attacks in view of the almost equal immunity against recurrence, mutually exhibited by the two infections, would be more or less difficult.

In Clifford Allbutt's "System of Medicine" (ii., p. 578) reference is made to this subject by Dr. T. D. Acland, in his exhaustive article on Vaccinia. He says:—

Great variations may be met with in susceptibility to vaccinia as well as to small-pox, or any of the acute exanthems. It is commonly recognized that one attack of small-pox renders the individual more or less immune against contracting the disease again; and similarly that one successful vaccination protects, at any rate for a time, against the probability of a second successful inoculation. But it would seem that, in some persons, one attack is no safeguard against a second. This is well illustrated by a case that came under the notice of Dr. C. Allbutt, in which a woman had small-pox three times, and was also three times successfully vaccinated. Such a case seems to set at defiance all laws deduced from ordinary observations, and may be regarded as the exception which proves the rule.

It is generally recognized, therefore, that second attacks are very unusual, and their occurrence within a short period of a first attack is remarkably rare.

It is interesting to note, therefore, that from April, 1902, to May, 1903, when 4,029 cases of the disease had been reported, the assistant medical officer of health was able to record twelve cases of second attacks occurring one to seven months after complete recovery from the first attack, and running a course identical with that of the primary infection. Two such cases came under my own observation. One was treated by me in the second attack in the Isolation Hospital, and the other was seen by me in company with her medical attendant at her own house. Both cases presented unmistakable evidence of a recent (primary) attack;

they showed characteristic macules, which were scattered over the face, trunk and limbs, including the palms of the hands and soles of the feet. Furthermore, the account given by the patients themselves was in accord with the facts observed by myself. In both instances the second attack ran a mild course; the prodromal symptoms were slight and the eruption desiccated rapidly. In one case marked pitting of the face resulted after the second attack. This comparative frequency of reinfection in this epidemic was another of the many peculiarities of the "Trinidad epidemic."

It is not likely that faulty diagnoses were made. The identity of the attacks in the same epidemic could hardly have been mistaken, especially as great care was exercised in the examination of these cases so as to exclude any possibility of error, knowing the rarity of such a condition under normal circumstances.

I may here mention, however, that five cases were sent to the Isolation Hospital which proved not to be cases of small-pox. Two were cases of ordinary acne, one of malarial fever accompanied with sudamina, and two of syphilitic rashes (pustular syphiloderm). The last two are of some interest and demand special notice.

N. S., aged 21, vaccinated successfully in January, 1903, and showing four large vaccinia scars on the flexor surface of the left forearm, was admitted to the Isolation Hospital on April 9, 1903, with the history of having had fever and sore throat for three days beginning on April 5, and the appearance of a rash on the face on the second day of illness.

Condition on Admission.—A fairly well nourished man with a measly rash on the face, trunk and limbs, eyes injected, throat congested, small ulcer with dirty greyish base and angry margin situated on left side of uvula. Tongue furred. Temperature normal.

Progress of Case.—The rash, which was at first papular, became vesicular here and there on the chest and pustular on the thighs. The size of the lesions did not increase, even when the vesicular or pustular stage was reached. The ulcer in the throat rapidly grew larger, and involved almost the whole of the uvula. For a long time the measly appearance of the rash was retained, and then it became scaly everywhere except on the chest and thighs. Under large doses of potassium iodide and mercury the rash disappeared and the ulcer in the throat healed. The patient also developed keratitis, but this yielded to persistent anti-syphilitic treatment. General aches and pains were often complained of, but there was no itching in the course of the disease. Fever in this case began on April 12, and continued with irregular remissions until

April 24. I was able to trace the past history of this patient, and found out that he had been admitted on February 28 to the syphilitic ward of the general hospital "with a single indurated ulcer on the under surface of the glans penis"; a well-marked cicatrix was left to tell the tale. This case, when first sent to the Isolation Hospital, was pointed out by those who held the view that the "prevailing eruptive fever" was not small-pox, as a proof of the correctness of their opinion. This man was unsuccessfully vaccinated by me during his stay in hospital.

A. F., aged 21, vaccinated at the age of 7, showed three good stigmata on the arm; was admitted on July 3 to the Isolation Hospital with the history of having had fever and slight headache on the preceding two days, and of the appearance of a rash on the hands and feet on July 2.

Condition on Admission.—Well-nourished man, with papular rash on the back, chest and limbs. Face quite free from eruption. Some of the papules were drying up, and others were capped with a tiny drop of pus. He had a chancre on the glans penis.

Progress of Case.—The papules never increased in size, nor did they vesiculate; several acquired pustular summits; most of them became scaly and were very persistent. The patient suffered from fever until August 4; he developed iritis of the right eye on July 21, which yielded to antisyphilitic drugs. The rash disappeared entirely at the end of August. This case was successfully vaccinated by me on July 21.

The history, the existence of chancre, the presence of pyrexia throughout, the character of the eruption, which did not develop into the large full pustules characteristic of variola, the want of uniformity in the size of the lesions and their polymorphic character, the slow course of the eruption, the presence of general pains and the absence of itching all marked out these two cases from the "prevailing eruptive fever."

RESULTS OF VACCINATION PERFORMED DURING DESQUAMATION OR SOON AFTER RECOVERY FROM THE DISEASE.

Owing to the uncertainty which existed in the minds of the profession in regard to the nature of the epidemic, every conceivable means was adopted to arrive at a correct diagnosis, and I thought some light might be thrown on the subject by applying the vaccination test to a certain number of cases. Accordingly I undertook a series of experiments with this object in view. The results which I obtained confirmed the opinion which I already entertained concerning the variolous nature of the

disease. I performed 204 primary vaccinations among adults and children who were in the desquamation stage of the disease or who had practically recovered from it. Of these thirteen did not return for inspection. Of the 191 cases that were inspected, 133 failed to react, fifty-four reacted slightly to the operation, and four seemed to be fairly successful. The "slight reaction" referred to above consisted in the delayed appearance at the site of inoculation of small red excrescences without any areola, resembling tiny mulberry growths, which dried up without further development. There was no vesiculation. In those in whom the reaction appeared "fairly successful" the vesicles were late in appearing and were ill developed; there was an absence in these cases of the inflammatory zone around the vesicles, and also a lack of general symptoms. On pricking these abortive vesicles a little viscid serum, followed by blood, exuded from them; on drying up a thin scab was formed, which on falling off left a small red excrescence, which gradually became absorbed until no trace of it was left behind. These vesicles therefore differed from the normal vaccinia vesicles in size, contents, evolution and involution. Amongst the 191 cases, four were vaccinated twice and three cases thrice, with negative results.

I also revaccinated during convalescence twenty-five cases which exhibited distinct evidence of previous vaccination. Sixteen of these gave no reaction whatever; four reacted slightly, abortive vesicles of the same character as already described being produced, and one gave a normal reaction. The others were not available for further observation. The case which gave a typical reaction was that of a child, R. H., aged 13, in whom the local manifestations were normal and attended with some constitutional disturbance. The child contracted the disease on June 15 and was vaccinated successfully on June 27, when she was practically well owing to the mildness of the attack. This child had been vaccinated in infancy and showed three good vaccination marks on the arm.

Besides these 229 cases one was vaccinated in the invasion and another in the early vesicular stage of the disease, and both gave a very slight reaction, which was much delayed. Four cases were vaccinated in the papular stage, two of which gave negative results; one reacted slightly, and the last exhibited an abortive vesicle. Thus 235 vaccinations were performed at various periods of the disease, the large majority of them being done during desquamation, with practically only one successful reaction. The vaccinations were performed in twenty-nine different series, and in fourteen of these "controls" were used, which consisted of forty-eight adults, eleven of whom had never been vaccinated before.

All the primary vaccinations were successful amongst the "controls," both as regards local and general manifestations, while there were twelve failures amongst the revaccinated. These experiments demonstrated clearly the variolous nature of the disease and the possibility of vaccinia running a normal course even after a recent attack of small-pox. It may be argued that the case of R. H. was not of a variolous nature, but I have not the shadow of a doubt in my own mind that this child passed through a mild attack of the disease.

I have not been able to obtain much information on the subject of vaccination after small-pox. Indeed, it would seem from an article in the *British Medical Journal*, January 31, 1903, p. 265, that observations on this subject are scanty and vague. The following extract is taken from that paper :—

The influence of a previous attack of small-pox on the success or failure of a subsequent vaccination is a question which has engaged the attention of several authorities. Beginning at the fountain-head, Jenner himself, in his third publication, "A Continuation of Facts and Observations relative to the Variolæ Vaccinæ, or Cow-pox," writes as follows : "Although the susceptibility of the virus of cow-pox is for the most part lost in those who have had the small-pox, yet in some constitutions it is only partially destroyed and in others it does not appear to be in the least diminished. By far the greater number on whom trials were made resisted it entirely, yet I found some on whose arms the pustule from inoculation was formed completely, but without producing the common efflorescent blush around it or any constitutional illness, whilst others have had the disease in the most perfect manner." From the figures in a table in Dr. Seaton's "Handbook on Vaccination" it appears that something like one-third of the adults who had suffered from small-pox were susceptible to the local results of vaccination in a perfect manner. In this table it is interesting to note that among the soldiers in the British Army—not recruits—the proportion of perfect success was 451 per 1,000, while among recruits the corresponding proportion was only 345. The difference suggests the element of time. The likelihood is that the interval between the attack of small-pox and subsequent vaccination was shorter on the average in the recruits than in the soldiers, the former being younger men. These statistics do not state the actual interval between the attack of small-pox and successful subsequent vaccination.

The writer of the article referred to above states that whatever may be said about exceptional susceptibility of individuals, this general conclusion is quite safely deducible from various recorded facts, viz., that local reaction of the skin, either to inoculated vaccinia or inoculated variola, does not in any way prove that the individual is susceptible to attack by small-pox in the ordinary way. The system may be protected,

though the skin can still be used for the cultivation of the virus; this principle applies both to small-pox inoculation and to vaccination. In the epidemic under review the large proportion of recurrences goes to prove that even after an attack of small-pox the individual may yet be left, in some rare instances, susceptible to reinfection, and in the case of R. H. it also shows that after an attack of small-pox the individual may, though rarely, be left susceptible to vaccinia.

In the *Lancet* of October 22, 1898, Dr. Brownlee and Dr. Thomson, in an article already referred to, write as follows on the relation of vaccination and antecedent small-pox to an infectious disease which closely resembled chicken-pox and small-pox :—

A certain amount of weight was given in the decision to the fact that three of the patients had already passed through an attack of severe small-pox, two of them comparatively recently. The small-pox in at least two of the cases was unmodified. Four of the patients were revaccinated successfully during the crusting stage, while the others had been revaccinated with success from two to four weeks before the first appearance of symptoms. It may be supposed that comparatively little value should be attached to this point, but successful vaccination of small-pox convalescents, as well as the occurrence of small-pox so soon after successful revaccination, is entirely contrary to the experience of small-pox in Glasgow. An examination into the question among the cases treated in hospital during the last five years shows that fifty-two small-pox patients were vaccinated at various periods during the stage of eruption and convalescence, some twice or even thrice, but in no single instance was any reaction manifested except in some cases a slight redness of the skin, such as might occur in the neighbourhood of any superficial wound.

The conclusion deducible from my own observations is that in rare instances vaccinia or variola may occur in a person recently attacked by small-pox and run a normal course. This subject is surrounded with difficulties, seeing that we have to deal with factors so variable as the human body and the variolous disease, and also with vaccination, performed so very differently as regards degree of efficiency.

Several cases were vaccinated in the incubation period of the disease, when they appeared to be in perfect health; the results were very interesting and showed the influence of vaccination in modifying the course of the disease when performed within a certain period after exposure to the contagion. I have a record of nine cases. Three who were vaccinated in the morning developed the initial symptoms of small-pox in the evening of the same day, and both vaccinia and variola ran their course concurrently without the one or the other being modified (fig. 4). One case was vaccinated two days before the onset of

prodromal symptoms and both diseases ran a normal course. In four cases the invasion symptoms of small-pox appeared at an interval of four to eight days after vaccination, and in all these vaccinia ran a typical course, but the variolous attack was modified. In one instance there was an interval of eleven days between the vaccination and the onset of initial symptoms of small-pox, and yet the latter disease was modified.

A case which at first sight appeared to be one of generalized vaccinia came under my care in the course of my observations. J. J., aged 5 months, was seen by me on October 10; he had two small ulcers on the left arm, evidently following vaccination, which the mother stated had been performed at least three weeks before in St. Vincent. The child arrived in Trinidad on October 4, and on the next day he developed fever, which was followed on October 6 by a rash which was first observed around the two ulcers on the arm. When the child came under my care there were several small ulcers around the two referred to above, and a few papules of varied sizes on the forearms, right arm, chest and abdomen. The papules became transformed into vesicles, which, on rupturing, discharged a clear, serous fluid, and subsequently ulcers were formed, and these continued to exude serous fluid for some time and then became covered with yellow crusts. I inoculated a healthy infant, with lymph obtained from the vesicles on the thigh of this child, on October 13; the result at the site of insertion was an abortive vesicle which rapidly dried up, leaving no trace behind. No general symptoms were present during its evolution and there was no areola around the vesicle. On November 11 I revaccinated the same infant with glycerinated calf lymph and two typical vaccinia vesicles developed, accompanied by the usual constitutional reaction. This showed beyond doubt that the eruption in the first child was not a genuine "vaccinide."

VACCINATION OF CHILDREN BORN OF VARIOLOUS MOTHERS.

(a) Children born of mothers in the invasion or very early eruptive stage.—Two children born of mothers in the invasion stage of the disease were vaccinated soon after birth, and both "took" well. I observed that children born of mothers in this stage of the disease when exposed to the contagion contracted the disease. I saw six such cases.

(b) Children born of mothers in the late stage of the disease, during desquamation or convalescence.—Thirty-six children born of mothers at this stage of the disease were vaccinated within a few days of their

birth; two of these showed external manifestations of having passed through an attack *in utero*. Of the thirty-six cases, twenty-five failed to react to the operation, that is, 69·45 per cent., and eleven "took," that is, 30·55 per cent. Two of the eleven successful cases did not exhibit quite typical vaccine vesicles. Of the twenty-five unsuccessful cases, eleven were revaccinated, four unsuccessfully. I vaccinated five of the remaining seven for the third time and obtained a successful reaction in two cases. I again vaccinated one of the three unsuccessful cases for the fourth time with success.

All the children were vaccinated in groups of four or five, and in every series I used controls—seventy-two in all: five adults and sixty-seven infants of the same age as the above cases. Sixty controls were successfully vaccinated, that is, 83·34 per cent., and twelve were unsuccessful, that is, 16·66 per cent. I revaccinated nine of the twelve unsuccessful cases and obtained a typical reaction in five. I again vaccinated the four refractory cases, and two of them reacted to the operation normally.

I observed that children born of variolous mothers at this late stage of the disease were not attacked, though exposed to the contagion. It would seem, therefore, that children born of variolous mothers at this stage enjoyed a certain degree of immunity, but the further history of the cases showed that this immunity was only temporary; vaccination performed at a later period proved successful in all these cases. I was also able to observe the effect of revaccination during pregnancy on the foetus in two instances. Two infants born of mothers who had been successfully revaccinated in the later part of their pregnancy were used among my "controls," and both were refractory to vaccination. They were vaccinated a few days after birth. Three months after they reacted in a normal manner to revaccination. Two women who had the disease when one month and two months pregnant respectively gave birth to full-term healthy children who reacted normally to vaccination.

The above observations show that besides the protection afforded by contracting the disease *in utero*, the foetus may acquire a certain degree of immunity from the mother without itself passing through a regular attack of the disease. This must take place either by the simple transmission of the already developed immunizing substances from the mother to the foetus by way of the placenta, or (as a result of a reaction in the foetus) to the immunizing agent passing through the same channel from the mother. By the former method, fluids which are already endowed with properties upon which immunity depends are introduced into the foetus, whereas by the latter method these properties must first be

elaborated in the foetus before immunity is conferred. The short duration of the immunity conferred in my cases would seem to indicate that the first method was the one which was operative, the children remaining protected only as long as the immunizing substances which were transferred from the parent to them were retained.

Dr. Masson and I inoculated two monkeys with matter taken from two patients under my care in the isolation ward in July, 1903. Both monkeys were vaccinated with the same lymph, one by Dr. Masson and the other by myself. My case gave only a slight reaction, whilst Dr. Masson obtained a very successful result, which he recorded in the *British Medical Journal* of September 26, 1903, p. 779 (fig. 20).



FIG. 20.

Monkey inoculated by Dr. Masson with variolous lymph; three vesicles were developed at the site of the inoculation.

VARIATIONS IN VIRULENCE OF EPIDEMICS AND MORTALITY-RATE.

Small-pox, like all other epidemic diseases, varies in its intensity in different outbreaks. Sydenham states that "small-pox has its peculiar kinds, which take one form during one series of years and another during

another." Mild outbreaks have been observed in all ages even in pre-vaccination times, and have occasionally, we are told, been mistaken for chicken-pox.

In the great pandemic of 1871—2 this Colony suffered severely; like all pandemic extensions of the disease this was characterized by its great virulence. During that epidemic 12,531 persons were attacked and 2,449 deaths occurred. This high death-rate (19·5 per cent.) bore out the experience that in the negro and coloured races small-pox is a severe affection and attended with a high mortality.

In the recent epidemic, mildness of type was shown in the slight diffusiveness of the contagion, the insignificant symptoms exhibited by a large proportion of the cases, and in the extremely low mortality. On the other hand, a large number of vaccinated persons were attacked even more severely in some instances than the unprotected. This certainly appeared to be a very anomalous occurrence, but the term "vaccinated" cannot be considered equivalent to "protected," and the apparent anomaly may perhaps be explained in the majority of instances by the fact that in these persons the original protection afforded by vaccination had worn itself out. There were some cases, however, where vaccination was of comparatively recent date, and yet the protective power was inoperative, at any rate against attack by the disease. This epidemic maintained a degree of mildness which has never before been witnessed in this Island since the introduction of the disease by the Spaniards in the early part of the sixteenth century. Indeed, the case mortality is the lowest that has ever been recorded in any country. That only twenty-eight deaths should occur during an epidemic attacking 5,154 persons, consisting chiefly of negroes, is a result which is without parallel in the recorded history of the disease. And the fact that the disorder among infants and children was rarely fatal is also very remarkable (Tables III. and IV.). Among the 564 cases that came under my care, thirteen deaths occurred. When it is borne in mind that the worst cases were treated in the Isolation Hospital, such a result is almost incomprehensible. No small wonder that much doubt and hesitancy were felt in the diagnosis of such an anomalous form of small-pox, especially when cases literally covered all over with pocks escaped death. It would appear that a fatal termination in small-pox is not determined solely by the outward manifestations of the disease, but chiefly by the virulence of the poison which attacks the system. As the virus in this epidemic was mild, few deaths occurred, notwithstanding the abundance of the eruption in many cases.

Dr. Montizambert, in an article already referred to, says in regard to the mildness of the epidemic which visited Canada in 1900 :—

It has been suggested that the mildness of type is due to some meteorological condition. Against this theory is the fact that during the period since its commencement we have had at least one intercurrent outbreak of a very virulent form of the disease introduced from the Orient. It was quickly limited and stamped out. But in the score or so of cases that occurred the mortality ran up to over 50 per cent.

Anomalous forms of small-pox were not unknown in prevaccination times, though they were not invariably regarded as of a variolous nature. At one time an almost unanimous belief was held by the medical profession that an attack of small-pox was an absolute and lifelong protection against another attack, so that when a person who presented the traces of a previous attack became affected the disease was called "horn-pox," "water-pox," &c.

Mild epidemics of small-pox have also been described under various names. I shall refer to two classical outbreaks which occurred in Jenner's time.

At the latter end of 1789 an eruptive fever, which was known to the common people as "swine-pox," broke out in various parts of Gloucestershire and appeared to have greatly puzzled the medical men there. Jenner cut the Gordian knot by inoculating his own child, then aged about 10 months, with matter taken from its nurse, who was affected with this mysterious malady; this inoculation was successful, and the test of variolation, which was afterwards applied on several occasions, showed that the child had been protected against small-pox. From this experiment it may be safely concluded that that eruptive fever was variolous in its nature.

In the year 1807, Dr. Adams, of the London Small-pox Hospital, took matter from an outbreak of what, owing to the white appearance and small size of the vesicles, was called "pearl-pox," for inoculation purposes. The result which he obtained with this lymph was identical with that from the usual type of small-pox, showing that the disease was undoubtedly variola. Death-rates in these two epidemics were low.

The mildness of type is due either to attenuation in the virulence of the exciting cause, to a heightened resistance of the individual affected, or to a combination of these factors. We know that all organisms are susceptible of variation, especially with changed conditions of environment. Attenuated forms of bacteria are produced under injurious influences, whereas exalted virulence may be secured under favourable

conditions. Most of the variations with which we are familiar are temporary, and soon disappear after a return to the normal conditions, but some become permanent and heritable even after such a return, and thus give origin to new varieties. If these variations in attenuation or exaltation of virulence can be produced by artificial means, there is no reason to suppose that spontaneous variations do not occur, especially as we know that influences capable of affecting virulence in the laboratory are operative in Nature. Indeed, we meet with varying degrees of virulence under natural conditions in the case of some pathogenic bacteria, *e.g.*, *Bacillus diphtheriæ* and pyogenic cocci. In this way may be explained, perhaps, the varying characters of epidemics.

These variations are not confined only to micro-organisms; the zoologist and botanist, by removing animals and plants to different climates and different soils, have shown that the natural forms and species are capable of alteration.

From experiments of Guillou, Thiele of Kasan, Trousseau, Delpech, and others, it would seem that there is a possibility of attenuating the virus of small-pox without the intervention of the cow.

Jenner always looked upon variola and vaccinia as modifications of the same distemper, and Somering expresses very well the identity of these two diseases thus: "Variola et vaccinia sunt morbi, non suâ naturâ sed gradû, diversi." The most recent scientific investigations of the subject strengthen the theory enunciated by Jenner and supported by Somering. Most of those who have worked in this field claim to have obtained positive results as regards the production of typical vaccinia after one or two removes, as the result of variolation of the calf. It may be presumed, therefore, that variola and vaccinia sprang from a common stock; the former departed from the original type and, by successive reproduction in man under conditions favourable to its propagation and activity, acquired its well-known virulence. It may be that the organism of small-pox in this epidemic had degenerated or reverted to its ancestral type owing to unfavourable influences.

Predisposition is also another factor which must be considered; but it plays a less important rôle, especially in reference to small-pox; though there is a marked racial susceptibility to the disease, predisposition as applied to individuals of the same race is of minor consequence. When ordinary small-pox attacks a mixed population of whites and negroes the latter are proportionately more frequently attacked, and the attacks are more severe in this class, for the degree of susceptibility influences not only the capacity to acquire the disease, but also severity. Predisposition

in mild varieties of small-pox may, however, be a more important factor than it is in the usual type of the disease. Probably to the combination of these two factors is due the mildness of type in the present epidemic.

Essentially this eruptive fever and small-pox are alike; they differ rather in degree than in kind. The absence or almost entire absence of constitutional symptoms in comparison with the abundance of the eruption; the absence of secondary fever in a large proportion of the cases; the fact that a great number of unvaccinated persons had mild or abortive attacks, whilst some of the vaccinated suffered severely; the frequency of recurrences within a short period of the first attack or after recent vaccination; the bullous character of the eruption in some severe cases; the appearance of the rash in successive crops in many instances; the apparently slight infectivity of the disorder, and its slow spread among a black population largely leavened with unvaccinated immigrants; the occasional vaccinal reaction during convalescence or after recovery from the disease, and the extremely low case mortality, especially among infants and children, are facts which are difficult to explain in association with small-pox, but in the face of other and more important and salient features which I have described, these anomalies must be regarded as of little weight as affecting the diagnosis of the disease.

When one considers the history, the age-incidence, the initial symptoms, the distribution, order of appearance, character and course of the eruption in the majority of the cases, the frequency and nature of the complications and sequelæ, the occurrence of a typical hæmorrhagic case during the epidemic, the infection of the fœtus, the influence of vaccination and other facts mentioned in this paper, I think I am warranted in coming to the conclusion and in recording the fact that the Trinidad epidemic of 1902—4 was a mild and irregular form of small-pox.

TABLE I.

Showing nationality of the 564 patients under treatment in the Isolation Hospital.

Barbados	...	...	...	...	254
Trinidad	...	...	...	...	118
St. Vincent	...	...	...	...	61
Grenada	...	...	...	...	24
Demerara	...	...	...	...	23
Tobago	...	...	...	...	21
Venezuela	...	...	...	...	19
Dominica	...	...	...	...	8
St. Kitts	...	...	...	...	8
Antigua	...	...	...	...	7
Montserrat	...	...	...	...	5
Nevis	...	...	...	...	4
Martinique	...	...	...	...	3
Cariacon	...	...	...	...	2
St. Martin	...	...	...	...	2
St. Thomas	...	...	...	...	1
St. Lucia	...	...	...	...	1
Saba ...	...	...	...	...	1
Colon	...	...	...	...	1
India	...	...	...	...	1
					564

TABLE II.

Showing age and sex of the 564 patients under treatment in the Isolation Hospital.

	Male	Female	Total
Under 5 years	14	7	21
5-9	7	7	14
10-14	15	19	34
15-19	43	42	85
20-24	87	55	142
25-29	79	32	111
30-34	45	19	64
35-39	27	12	39
40-44	16	10	26
45-49	8	4	12
50-54	7	2	9
55-59	2	2	4
60-64	0	0	0
65-69	0	1	1
70-74	0	0	0
75-79	1	0	1
80-84	0	0	0
85-89	1	0	1
352		212	564

TABLE III.

Showing number of infants under treatment in the Isolation Hospital and the mortality among them.

	No. of Cases	No. of Deaths
Abortive	2	0
Mild discrete	6	1
Severe discrete	4	1
Confluent	0	0
12		2

Remarks.—The two aborted cases occurred in infants who had been vaccinated a few days before the attack of small-pox declared itself. The two infants who died were twenty and thirty-two days old respectively.

TABLE IV.

Showing number of children aged 1—4, who were under treatment in the Isolation Hospital.

	No. of Cases	No. of Deaths
Abortive ...	0	0
Mild discrete ...	8	0
Severe discrete ...	1	0
Confluent ...	0	0
	<hr/> 9	<hr/> 0

Remarks.—All were unvaccinated except one, aged 3, who was vaccinated at the age of 3 months and showed two good marks.

TABLE V.

Showing race of 564 patients under treatment in the Isolation Hospital.

Negroes ...	514
Whites ...	9
Mixed ...	40
East Indians ...	1
	<hr/> 564

TABLE VI.

Showing mortality in each variety of the disease.

	Vaccinated	Unvaccinated	Percentage
Abortive ...	0	0	—
Mild discrete ...	0	5	1.38
Severe discrete ...	0	2	1.04
Confluent ...	0	5	27.77
Hæmorrhagic ...	0	1	100
	<hr/> 0	<hr/> 13	

TABLE VII.

Showing incidence of the disease upon the nursing staff of the Isolation Hospital.

	Number employed	Number attacked
(1) Unvaccinated ...	3	3
(2) Vaccinated successfully one week to four years previous to joining staff ...	7	0
(3) Re-vaccinated successfully one week to four years previous to joining staff ...	15	0
(4) Vaccinated successfully in infancy ...	8	0
(5) Vaccinated thrice unsuccessfully ...	1	0
(6) Vaccinated in infancy and contracted variola same week	1	0
(7) Unvaccinated, but contracted the disease at beginning of epidemic before joining the staff ...	1	0
	<hr/> 36	<hr/> 3

Remarks.—Of the eight who were vaccinated successfully in infancy five were revaccinated without success before joining the staff, and three after they had been ten, fifty-two, and seventy-two days respectively in the isolation ward. The last was successful.

TABLE VIII.

Total number of cases reported to week ended April 11, 1903 ...	2,009
Total number of deaths ...	10
Total number of cases reported during four weeks ended May 9 in—	
(1) Port-of-Spain ...	1,123
(2) Country districts ...	96

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TABLE VIII.—(continued).

Total number of cases reported to week ended May 9	3,228
Total number of deaths	...	...	...	...	...	14
Total number of cases reported during four weeks ended June 6, in—						
(1) Port-of-Spain	...	...	...	826		
(2) Country districts	...	...	...	147		
Total number of cases reported to week ended June 6	...	...	...	...	...	4,201
Total number of deaths	...	...	...	...	...	20
Total number of cases reported during four weeks ended July 4 in—						
(1) Port-of-Spain	...	...	...	329		
(2) Country districts	...	...	...	123		
Total number of cases reported to week ended July 4	...	...	...	...	...	4,653
Total number of deaths	...	...	...	...	...	25
Total number of cases reported during four weeks ended August 1 in—						
(1) Port-of-Spain	...	...	...	143		
(2) Country districts	...	...	...	53		
Total number of cases reported to week ended August 1	...	...	...	...	...	4,849
Total number of deaths	...	...	...	...	...	26
Total number of cases reported during four weeks ended August 29 in—						
(1) Port-of-Spain	...	...	...	69		
(2) Country districts	...	...	...	68		
Total number of cases reported to week ended August 29	...	...	...	...	...	4,986
Total number of deaths	...	...	...	...	...	26
Total number of cases reported during four weeks ended September 26 in—						
(1) Port-of-Spain	...	...	...	34		
(2) Country districts	...	...	...	56		
Total number of cases reported to week ended September 26	...	...	...	...	...	5,076
Total number of deaths	...	...	...	...	...	28
Total number of cases reported during four weeks ended October 24 in—						
(1) Port-of-Spain	...	...	...	5		
(2) Country districts	...	...	...	32		
Total number of cases reported to week ended October 24	...	...	...	...	...	5,113
Total number of deaths	...	...	...	...	...	28
Total number of cases reported during four weeks ended November 21 in—						
(1) Port-of-Spain	...	...	...	0		
(2) Country districts	...	...	...	24		
Total number of cases reported to week ended November 21	...	...	...	...	...	5,137
Total number of deaths	...	...	...	...	...	28
Total number of cases reported during four weeks ended December 19 in—						
(1) Port-of-Spain	...	...	...	3		
(2) Country districts	...	...	...	9		
Total number of cases reported to week ended December 19	...	...	...	...	...	5,149
Total number of deaths	...	...	...	...	...	28
Total number of cases reported during four weeks ended January 16 in—						
(1) Port of-Spain	...	...	...	0		
(2) Country districts	...	...	...	5		
Total number of cases reported to week ended January 16	...	...	...	...	...	5,154
Total number of deaths	...	...	...	...	...	28

Remarks.—From October 17 to November 21, 1903, no new cases occurred in Port-of-Spain. During the last week of November three cases were reported, and these were the last cases which occurred in Port-of-Spain in the town. No cases were reported from the country districts after January 6, 1904.

Epidemiological Section.

May 22, 1908.

Dr. A. NEWSHOLME, President of the Section, in the Chair.

Preventive Medicine at Panama.

By Sir FREDERICK TREVES, Bt., G.C.V.O., C.B., LL.D.

THE Isthmus of Panama is at this moment the scene of an enterprise in sanitation of surprising magnitude, an enterprise which serves to display the forces of Preventive Medicine on a scale never before paralleled.

I visited the isthmus in February of last year and had the advantage of seeing this remarkable work under the guidance of Colonel Gorgas, the chief sanitary officer. To Colonel Gorgas is due the credit of an undertaking which in its aims and its results is not one whit less astonishing than the work of connecting by means of a canal the two great oceans of the world. Colonel Gorgas is clearing of disease one of the most pestilential spots in the tropics, and is making of the same a place where men can live in safety and in reasonable health. He is at the same time demonstrating practically the soundness and efficiency of the most recent claims of Preventive Medicine.

The isthmus is situated near to the Equator, the city of Panama standing in about the latitude of 9° N. This part of the world, ever since its discovery by Columbus, has been more or less notorious for its unhealthiness. Enriquez de Guzman, who came here in 1534, says that of every 100 men who went to Peru by way of the isthmus eighty never returned. The mortality among the Spanish gold trains was known to be very high. Equally disastrous did the isthmus prove to the hordes of men who passed westward on their way to the goldfields of California. The number of labourers who died annually during the construction of the canal by the French company is not known, but the mortality was so high that on more than one occasion the work had almost to cease

owing to the ravages of yellow fever. The deaths must have amounted to many thousands. So high was the death-rate among the labourers who constructed the Trans-Isthmian Railway that it has been said—probably with some truth—that every sleeper beneath the lines represents a human life. This railway was completed in 1855. The chief causes of the great mortality on the isthmus have been yellow fever, malaria and dysentery, with occasional outbreaks of small-pox. It may be called to mind that Sir Francis Drake contracted on the isthmus the dysentery of which he died, and that he lies buried just off the coast. It was on the isthmus also that his brother succumbed to yellow fever.

The isthmus, at its narrowest part, is about thirty-three miles in a direct line. The railway, which follows a winding course, covers $47\frac{1}{2}$ miles from Colon to Panama. Along the isthmus and parallel to its shores runs a ridge of hills, the ultimate offshoot of the Andes. This line of high ground is nearer to the Pacific than to the Caribbean Sea, the Culebra Pass, through which the canal has to make its way, being some ten miles from Panama. The rainfall on the Pacific side is from 50 in. to 60 in. annually; while on the Atlantic side it ranges from 100 in. to 150 in. The mean temperature of the district may be taken as 82° F., the mean humidity as 88. The tide on the Pacific coast rises 14 ft., while on the Atlantic shore the rise is only 14 in. The country for the most part is covered by dense jungle, while the lowlands, especially on the northern side, are occupied by extensive swamps. The highlands present bare and open country with extensive tracts of prairie, grass downs and breezy slopes. The denseness of the forest tracts may be illustrated by the fact that Dampier when he crossed the isthmus in 1681, with Wafer, the surgeon, and forty-four pirates, only made on an average five miles a day. He attempted a wider part of the isthmus and followed a devious course, so that the traverse of 110 miles occupied twenty-three days. Major Ronald Ross, speaking of sanitation in Panama, says: "The country is one of the worst to deal with which I have ever seen."¹

The unhealthiness of the Panama area has been due, as has been already said, in the main to yellow fever and malaria. The actual mortality from these causes during the French occupation has never been published, but the fatality of these diseases can be to some extent gauged by the records of the British Army in the adjacent West Indies. Sir John Moore's garrison on St. Lucia amounted in June, 1796, to 4,000

¹ *Lancet*, 1907, ii., p. 886.

men. By November the force had been reduced to 1,000 fit for duty and 1,500 sick. The campaign that lasted from 1793 to 1796 resulted, writes Fortescue, "in the total of 80,000 soldiers lost to the service, including 4,000 actually dead, the latter number exceeding the total losses of Wellington's army from death, discharges, desertions and all causes from the beginning to the end of the Peninsular War." The mortality was highest during the year 1794, when, of General Grey's original force of 7,000 men, no less than 5,000 perished during the course of the twelve months. It is probably beneath the mark, says Fortescue, that 12,000 Englishmen were buried in the West Indies during this single year. In 1780, four newly raised regiments were ordered to Jamaica. They stopped on the way at St. Lucia, where they contracted yellow fever. By the time the transports reached Kingston they had lost 168 men by death and had 780 on the sick list. During the course of the first five months at Jamaica 1,100 more of the survivors had died of fever. It was then that Dalling, the Governor, placed the matter before the Secretary of State in the following words: "Considered only as *an article of commerce*, these 1,100 men have cost £22,000, a sum which, if laid out above ground, might have saved half their lives." In this sentence lies no little of the secret of the great success of the Americans in Panama. In addition to the dictates of humanity they have realized the part played by the labourer as an "article of commerce." The realization of this fact by governments engaged in great enterprises of either war or peace comes, unfortunately, very late in the history of State-controlled sanitation.

The Isthmian Canal Commission was created in May, 1904. The commissioners found on the canal area a condition of chaos: the plant neglected, the district overgrown by tropical vegetation, little, if any, attempt at sanitation, and inadequate accommodation for the men employed. They found 3,000 labourers—mostly Jamaican negroes—still engaged on the works, and two French doctors, one at Panama and the other at Culebra. The Commission obtained from the Republic of Panama a grant in perpetuity of the land now known as the Canal Zone. This strip of land is ten miles wide—the line of the canal being in the centre—and extends from sea to sea. Over the Canal Zone the United States have practically as complete control as if the territory were part of the home country, maintaining within its limits their own police and governing by their own laws. The grant included the group of islands in the Bay of Panama, but did not include the towns of Colon and Panama, although they are both on the canal strip. Colon, at the time

of the occupation, had a population of 6,000 and Panama of 18,000. The position of these two towns, however, is defined in the following article: "The Republic of Panama agrees that the cities of Panama and Colon shall comply in perpetuity with the sanitary ordinances, whether of a preventive or curative character, prescribed by the United States, and in case the government of Panama is unable, or fails in its duty, to enforce this compliance of the cities of Panama and Colon with the sanitary ordinances of the United States, the Republic of Panama grants to the United States the right and authority to enforce the same." A like authority is granted to the United States to maintain public order in the two cities, should the Republic not be able, in the judgment of the United States, to maintain such order. The United States, moreover, obtained the power to drain these two cities, to provide them with a water supply, and to levy a water and sewerage rate to defray the cost of the same.

It may be said that the sanitation of the two cities at the time of the creation of the Commission was that of the Middle Ages. Water was obtained from rain-butts and shallow wells; there was no attempt at drainage, and the disposal of refuse was left to the individual householder.

The Commission realized immediately that if the canal was to be constructed, "thorough sanitation was the first essential." In every published report sanitary measures occupy the most prominent position. The medical officer of health was allowed absolute powers; he was assured (1905 Report) that "the entire resources of the Commission" were at his disposal, and funds were immediately forthcoming for all such undertakings as he considered necessary.

The views of the Commission on this question are expressed in the following words: "The importance of completing the sanitation of the Isthmus of Panama can hardly be exaggerated, for upon it depends not only the construction of the Isthmian Canal, but also the utility of the canal when completed, and the question as to whether the canal is to be a blessing or an affliction upon the inhabitants of the earth." It was realized that unless yellow fever was stamped out the canal would become the means of carrying that disease eastwards, since the lifetime of the *stegomyia* has been shown to be about three months.

Sanitary works were among the very first undertaken by the Commission, and Colonel Gorgas must allow that his department has received throughout the most liberal and sympathetic support of the Government.

In 1905 the number of men employed on the canal and railway was 19,500. In the sanitation section, nearly 2,000 men were exclusively



FIG. 1.

Bottle Alley, Colon, before paving, September, 1906.



FIG. 2.

Bottle Alley, Colon, after paving, June, 1907.

engaged. The death-rate for the year was 24·3 per thousand. The number of the constantly sick, 30 per thousand, and the deaths from yellow fever, 47. In 1906, the deaths due to yellow fever fell to 7, and since that time the disease has disappeared. The mortality for the year 1906 was 17·5 per thousand among the whites and 53 per thousand among the blacks. In 1907 the number of the employees was 29,446. The constantly sick were 29 per thousand. The death-rate among the white population had dropped to 15·9 per thousand and among the blacks to 45·3 per thousand.

The sanitary works commenced in 1904, and since then developed or completed, have been upon the following lines:—

In the first place the housing of the employees was taken in hand. Excellent houses, barracks, boarding-houses and hotels were built along the canal track. The rooms are lofty, light and well ventilated, while all are screened with copper gauze. They are provided with modern sanitary conveniences, with a good water supply and with modern plumbing. Better dwellings for a tropical climate with a heavy rainfall could hardly be designed. The feeding of the labourers has been a matter of especial care and of exceptional difficulty, on account of the fact that the bulk of the supplies have to come from the States. Numerous public kitchens and restaurants have been established, where excellent food can be obtained at a minimum cost. As the West Indian negro is apt to feed himself meanly in order to save money, his wages are paid partly in board, so the security is obtained that he is amply fed. Previous to this arrangement many of the men almost starved themselves, and became thereby reduced in efficiency and in health. Ample holidays and rest days are instituted; reading rooms have been established along the zone, and clubs founded for every kind of recreation which is possible in a hot climate. A vessel is employed for free excursions to the island of Taboga, in the Bay of Panama, and every step is taken to keep the men upon whom the success of this great work depends in sound condition. One of the earliest matters undertaken was the providing of accommodation for the sick. The hospital at Ancon was greatly enlarged, and other hospitals built where required along the Canal Zone. The hospital at Ancon is a model building of its kind, replete with every modern appliance, and, indeed, as well equipped as any first-class European hospital. It is served by a specially selected staff, and in connection with the institution are ample laboratories for bacteriological and pathological work, for the chemical analysis of foods, &c., and for general investigations in connection with the sanitation of

the district. Looking back some ten years, it is scarcely to be believed that a body of engineers entrusted with the most stupendous construction of modern times should have recognized that among the *first* requirements to ensure success was a bacteriological laboratory. Colonel Gorgas, the chief sanitary officer, had further to secure proper hospital accommodation for the sick poor of the two cities, for the lepers, and for the insane. Such lepers as were unable to work lived in wretched hovels on the beach, where they existed in much the same way as the land crab. The insane poor were allowed to roam over the land or were looked after by their friends. If they became violent they were placed in the stocks or were cast into the city prison. The Commission has now provided both lazar houses and lunatic asylums. The hospital accommodation available on the canal area amounted in 1907 to 1,845 beds.

Then came the great undertaking of making reservoirs and of providing Panama and Colon with a good and constant water supply. As soon as this work was accomplished the numerous shallow wells were filled in, water-butts, tanks and cisterns were removed, or, if left, were carefully covered in. Thus, in the year 1906, 307 wells were filled in in Panama City alone, while in the two towns 23,031 tanks or water barrels were dealt with. There followed upon this the still more extensive work of draining both the cities and carrying out a modern scheme of sewage disposal, of connecting the individual houses with the sewers, of introducing water-closets, and filling in the innumerable cesspools. It is very noteworthy with what determination the Commission insisted upon the carrying out of the sanitary orders they had imposed. For example, in 1906 the canal zone police made no less than 584 arrests for violation of sanitary regulations, while in 1907, 925 persons were arrested for the same offence. In the criminal statistics for the latter year it will be observed for purposes of comparison that the charge of "disorderly conduct" heads the list with 1,176 arrests; then comes "violation of sanitary regulations" with 925; and in the third place "drunk and disorderly," with 787 arrests. Another great work undertaken by the Commission was the paving of the public ways in the two cities, and the levelling and draining of the roads. The state of the streets in Colon and Panama in 1904 was no better and no worse than that to be found in any of the old cities on the Spanish Main or in the adjacent islands. Those who would form an idea of the condition of these highways should visit Cartagena on the mainland, or the famous city of San Domingo on the island of Haiti. They would find

there the surface of the main street as full of holes and gulleys as the bed of a dry torrent. To drive along these streets is an experience not to be forgotten. After a shower of rain the highway is a waste of mud interspersed by a hundred pools, which in the rainy season are never dry. The practice, moreover, of throwing all odd garbage into the streets makes their condition inconceivable. During the dry season these public ways are heavy with dust. In some of the smaller lanes about Cartagena the dust is as thick as the sand on a beach, and is only kept in check by the happy practice of emptying all slop water into the highway. To their other responsibilities the Canal Commission added the cleaning of the streets and the removal and destruction of refuse.

The most interesting work, however, undertaken by Colonel Gorgas and his staff was a crusade against the prevailing diseases on the isthmus. Of these the most important are yellow fever and malaria. Against yellow fever the inhabitants of the isthmus are immune, but they are not immune from malaria. Some 70 per cent. of the natives are the subjects of the latter disease, and it has proved most fatal. Taking the year 1907 as an example, the mortality lists on the Canal Zone present the following features: The total number of deaths was 3,822. The chief contribution to this number was made by pneumonia, which accounted for 716 deaths. The liability of the negro to pneumonia is well known, and the prominence of this disease throughout the West Indian islands is very striking. The fact that pneumonia heads the death-list in every year has no doubt suggested to the Commission that a crusade against this malady is a pressing matter. No data are forthcoming to explain the prevalence of pneumonia in the islands. The negro spends practically the whole of his day out of doors in a warm atmosphere, which is subject to but little variation of temperature the year through. At night he retires to his tiny cabin, the windows and doors of which he literally seals up; and when the number of human beings who may occupy one of these cabins during the night is noted, it is astonishing that they do not die of mere suffocation. This habit of the negro of hermetically sealing his cabin at night appears to be due solely to his fear of jumbies or ghosts, which are very troublesome on the Caribbean coast and can enter through the smallest chink. On the isthmus the houses provided for the labourer afford the amplest cubic space per man and are perfectly ventilated. They are screened with copper gauze, the meshes of which are too fine to admit even the slenderest jumbie. It is evident, therefore, that the home cabin of the

negro cannot wholly explain his liability to pneumonia, since it follows him to the isthmus. The next disease in the mortality list is malaria, which in 1907 was answerable for 605 deaths. Then come the following in order: Tuberculosis of the lungs, 304 deaths; enteric fever, 150 deaths; Bright's disease, 137 deaths; diarrhoea and enteritis (mostly among children), 136 deaths; dysentery, 118 deaths. In this year the number of deaths from small-pox was three. The liability of the negro to acute nephritis is well known and is shown by forty-eight deaths in 1907 and sixty-four in 1906 from this cause. To beriberi are ascribed 111 deaths in 1906 and fifty-nine in the year following. This outline of the death-rate may be completed by adding that in 1907, 236 deaths were due to accident or violence, including eight suicides.

The plan of campaign against yellow fever is as follows: The houses are in the first place screened. This screening is very complete. In the better residences not only are all the windows and doors screened, but also the verandahs. I have lived for a fortnight in a screened house and never saw a mosquito, but was bitten when out of doors. Mosquito nets are entirely dispensed with. Within the hotel at Panama I never saw a mosquito and no nets are used. The spring doors seem to be quite efficient. In the administration building guards are stationed at these doors to see that they are not propped open and that no one loiters in the doorway. In the fire buckets in this building larvæ are now never to be found. The *stegomyia* do not frequent the open country, nor do they breed in swamps or large bodies of water. They are "house dwellers" and require the protection of buildings, grass, foliage, &c. A system of house to house inspection was instituted to see that no mosquito larvæ were breeding; water-butts and tanks were destroyed or carefully covered over, while puddles in yards and elsewhere were oiled. Any subject of yellow fever was immediately isolated and "placed under a mosquito-bar." In order that no case, real or suspected, should pass unnoticed eight medical men were appointed in Panama City "to act as medical inspectors and to make a daily house to house canvass of the city, reporting all suspected cases to the Health Department." The house from which any case of yellow fever has been removed is cleaned and fumigated. It is made as nearly smoke-proof as possible, all cracks and openings are sealed with paper and paste, and each room is then fumigated with sulphur or pyrethrum. In from two to four hours the house is opened and thoroughly swept out, the sweepings being taken into the street and burned. Owing to the destructive action of sulphur, pyrethrum powder is in general use on the isthmus. As in the month

of June, 1905, the number of cases of yellow fever had mounted to sixty-two, the fumigation of the entire city of Panama was resolved upon. Since twelve days must elapse after the mosquito has bitten a fever patient before it can transmit the disease, it was desired to complete the work within that period. It occupied, however, forty-four days. It is impossible not to admire the docility of the people of Panama, especially as they are themselves immune, and to note that even as late as 1907 no less than fifty-nine of these citizens were fined for "having mosquito larvæ" on their premises. The average number of men employed in fumigating in Panama City alone was (in 1906) 110.

The crusade against malaria has been even more elaborate. Every new arrival on the isthmus is handed a printed circular explaining the cause of malaria and the means of its prevention, and advising the constant use of quinine in doses of at least 3 gr. a day. Quinine is placed on the table in the dining rooms and boarding camps, and large quantities of the drug are distributed broadcast. In the month of September, 1905, for example, 675,000 gr. were dispensed, mostly for prophylactic purposes. A large number of men are kept constantly employed in cutting down the dense tropical undergrowth, in mowing or burning the grass, in making and lining ditches, in filling in swamps and in oiling the surface of any pool or puddle in which mosquitoes might breed. Others are employed to inspect water tanks and barrels, to destroy such as can be dispensed with, and to screen such as are retained. As an example of the work of the anopheles brigade it may be noted that in 1906 in Colon alone the surface oiled amounted to 330,000 sq. ft. New ditches were cut to the extent of 200,000 lineal feet. Of these ditches 20,000 ft. were stoned or cemented. Two million lineal feet of old ditches were cleared, graded, stoned or filled in. The area of brush and grass cleared amounted to 21,000,000 sq. yds. Never has a crusade been carried out with such completeness, for never has a chief sanitary officer had so free a hand. It is needless to point out that the mere oiling of pools does not constitute the sole prophylactic measure against malaria. In a well-to-do town in the tropics it may be supposed that the land has been thoroughly drained and every suspected water area oiled, but there are still many varieties of vegetation which afford a breeding place for mosquitoes; as instances may be cited pines and such a palm as the traveller's palm. We may be sure that the pine grower will not sacrifice his harvest in the public interest, nor will the wealthy resident allow the palms, which are the glory of his garden, to be cut down. It is much to be hoped that a list will be forthcoming of

garden and other plants in which mosquitoes breed. On the Canal Zone no such list was needed. The place denounced was swept bare.

On one point of interest the reports of the Commission are silent. They do not state upon what grounds the crusade against the land crab is based. It will be noticed in the last report that in the course of the year in Cristobal alone no less than 30,566 crab holes were oiled and 10,571 crabs were killed. I am not aware that the land crab has ever been seriously studied from a medical or sanitary point of view. That the animal is a remarkable and agile scavenger is allowed; that his habits are disgusting and his place of hiding unhygienic are more or less evident; but I have not met with any account which accuses this creature of the dissemination of disease. The matter is of some interest. On the Island of Barbados, for example, are to be seen more land crabs to the square yard than I have noticed in any other part of the world, yet Barbados is a remarkably healthy island, entirely free from yellow fever and but slightly troubled with malaria. The land crab has there no price upon his head, and, except for the damage he does to gardens, graveyards, and roadsides, is not anathema.

Time will not permit of any account of the quarantine arrangements on the Canal Zone, nor of the very vigorous and successful manner in which an outbreak of bubonic plague was dealt with in 1905.

It will be seen, I hope, from the above brief description that the Isthmus of Panama provides at this moment an object-lesson which those who control the destinies of men might study with advantage. It provides for the realization of a long contemplated and heroic ideal—the medical officer of health with a free hand.

DISCUSSION.

The PRESIDENT (Dr. Newsholme) said Sir Frederick Treves had had a wonderful story to tell the Section, and those who had heard Sir Frederick before, and had read his writings, would know that the story had lost nothing in the telling. The members, he was sure, were all much obliged to him. Panama was evidently an administrative Elysium for medical officers of health. The immense progress in sanitation there had been due to necessity, though that did not detract from the credit accruing for the work, and in that respect there was a parallel in our own country, where cholera was the immediate determining cause of sanitary reform.

Sir SHIRLEY MURPHY said he had very much pleasure in proposing a vote of thanks to Sir Frederick Treves for his address. The subject was of entrancing interest to the Section, and its attractiveness was much heightened by the manner in which it had been presented. He knew the author had experienced some difficulties in connection with preparation, but no obstacles were apparent in the reading, and the Section was very grateful for the way Sir Frederick had presented the subject.

Dr. SANDWITH seconded the resolution of thanks. No one, he was sure, had enjoyed the paper more than he had, and he thought the author was a living illustration of how a man might cease to be a practitioner, might even, if he chose, cease to be a surgeon, but could not cease to be a citizen of the Empire; he might still do good work, and he (Dr. Sandwith) was glad to see that Sir Frederick had not ceased to be a teacher. The reader had made clear the different treatment meted out to the American medical officer compared with that accorded to his British confrère. At the time when yellow fever was stamped out in Havana the American medical officers were given military power, and he (Dr. Sandwith) suggested that medical officers of health in this country should try to get the same powers. It was a great surprise to him, after being some years abroad, to find the inferior position occupied by medical officers of health in this country compared with what their colleagues enjoyed abroad, for in the fight against epidemic disease it was essential to have officers who could be trusted to act. Sir Frederick Treves had spoken about yellow fever, malaria, and dysentery, and he (Dr. Sandwith) had been thinking how little the present generation realized the evils of malaria. Less than ten years ago the Egyptian Army was reoccupying the Sudan, and black troops were sent up the Blue Nile because they were supposed to be less susceptible to malaria than the Egyptians. Of course they were commanded by British officers. On coming to Karkog, a village about 300 miles from Khartum, the force consisted of 451 healthy men. Seventeen days later sixty-nine of them were struck down, and in another two days 380 men, or about 84 per cent., were down with malaria, ten deaths occurring within a few days. Of the thirteen British officers one died, six were seriously ill, and six were only slightly ill. From experience in the United States, Egypt, and South Africa, he could confirm Sir Frederick's statement as to the liability of the black man to get pneumonia. He had not an explanation to give for it, but thought there were obvious contributing factors. It was not at all unusual for a European to live for years with arrested or cured tuberculosis, but the African seemed always to succumb rapidly to it, and when he had pneumonia he often died of it. Again, a negro suffering from typhus was more apt than a European to die of hypostatic congestion of the lungs. One reason, he believed, was that the black did not take full breaths; he was generally a man of the plains, unaccustomed to deep breathing, and seemed to have no reserve of lung power which would tide him over a respiratory illness. Also the black seemed to have very feeble resistance to tubercle bacilli and pneumococci.

The resolution was cordially carried.

MR. MALCOLM WATSON said they had heard that night from Sir Frederick Treves an interesting account of the success with which the Americans had dealt with malaria and yellow fever in Panama. By the request of the Secretary he was there to ask them to turn to the other side of the lantern, and hear how a British Government had dealt with a somewhat similar problem. Panama was about 90° W. longitude, the Federated Malay States were some 90° E. They were within 5° of the Equator, had a heavy rainfall amounting to about 100 in. per annum, and had been notorious for a malarious climate. Early in 1901, on assuming duty as district surgeon in the district of Klang, he found the hospital full of malaria; Government officers were continually off duty with the disease. The town was smothered in jungle; acres of swamp, abounding with anophelines, stretched along the small hills on and around which the town was built. Setting himself to collect statistics of the disease, he was soon in a position to present a report to the Government of such a nature that money for drainage works was promised for the following year. Before, however, the year was out, the town was almost devastated by the disease, and the Chinese suspended business for three days in order that all their attention might be concentrated on processions, theatres, and such other rites as were essential to the driving of the devil from the town. As a result of the drainage, malaria had almost completely disappeared from the town, only some eight or ten cases per annum being found in which it was impossible to trace infection from outside. The result of the work at Klang would have been very striking had it been alone, but at the same time as the drainage of Klang was undertaken the drainage of Port Swettenham was also carried out, with equally satisfactory results. There had thus been two entirely independent experiments. Unlike Klang, in which there were small hills, Port Swettenham was originally a mangrove swamp covered by all spring tides. It was always malarious, and, early in 1901, he drew the attention of the Government to the necessity for antimalarial measures. The port was opened on September 15, 1901, and, in order to obtain statistics of the malaria, he deputed a subordinate to visit each house daily to record and treat each case of malaria as it arose. The epidemic, however, became of so severe a nature that the business of the port was completely disorganized and the propriety of closing it was discussed. A Commission, consisting of Dr. H. Wright, Dr. E. A. O. Travers, the speaker and three inquirers, was deputed by Government to report on and carry out the necessary sanitary measures, and the Commission carried out the measures which he had recommended some months before, viz., clearing jungle, draining, &c. The result of these measures was that within a few weeks the port was working smoothly and it was not found necessary to use wire gauze on the houses. From 1902 to 1907 Port Swettenham was practically free from malaria, but in 1907, as the result of the blocking of certain drains by new engineering works, a small outbreak occurred again. It was a very striking reversal of the experiment, but for the sake of the public health the drains had to be reopened as soon as the damage they were doing was shown. He did not

propose to go into the statistics of the malaria of the two towns in detail, but some idea of the value of the antimalarial measures would be gathered from the following: in 1901, 610 cases of malaria were admitted to Klang Hospital; in 1902, 1903, 1904, 1905, the numbers were respectively 199, 69, 32, 23; while from the surrounding undrained area the numbers increased. Not only did the admissions to hospital for malaria diminish, but there was an extraordinary decrease in the number of deaths, not only from malaria but from all other causes registered in the town, showing to what an extent malaria predisposed persons to other diseases. The number of deaths from all causes registered in the two towns were, in 1900 and 1901, 474 and 582 respectively, and in 1902, 1903, 1904, 1905, were 144, 115, 122, 113 respectively, and again the deaths registered without the towns showed an increase. The children, too, within the towns enjoyed an immunity from the disease in striking contrast to those outside; during 1904 and 1905 examinations of the children revealed no infection of those permanently resident within the towns, while in 1904 33.89 per cent. were infected of 298 children residing outside of the towns. In 1901, Government officers received 1,026 days sick leave on account of malaria; in 1905 only thirty days leave was given, and this was given to officers who, although resident in Klang, had contracted the disease outside. Finally he would like to say a word on the measures undertaken. In 1900 there was considerable discussion as to the relative merits of mosquito-netting, quinine and mosquito destruction. He followed the lines laid down by Ross, viz., mosquito destruction, and in order to obtain permanent results adopted drainage as the method. It appeared to him to be *the* method for towns, because first it was permanent and secondly it could be carried out independently of the coöperation of the population.

Professor RONALD ROSS, C.B., F.R.S., said that a very pleasant evening indeed had been spent in listening to Sir Frederick Treves's most interesting description and Dr. Malcolm Watson's account of his good work, which was perhaps scarcely second in importance and elegance—if such a term were permissible in that connection—to that of Colonel Gorgas, and only in the extent to which it was carried out. The colonel had all the resources of the American Republic behind him. Dr. Watson's work had been most excellently done. The point as to the great prevalence and fatality of pneumonia had been dealt with by Dr. Sandwith. He quite agreed that that disease was frequently the terminal complaint following malaria, dysentery, and other things. The same kind of pneumonia statistics were obtained in India among the troops there, both native and European. With regard to mosquitoes in trees, he had just come from Mauritius, and it was the same there. On the average, one hole was found in every three trees; but they did not breed anophelines there, only *stegomyia* and *culex*. It was not necessary to cut down the whole tree; the simplest way was to fill up the hole with mud. His moustiquiers made a kind of concrete out of red earth and lime, which was placed in the hole, and he believed it effectually stopped it for a long time. One of the mosquito destroyers had to make a tour of the trees once a year and stop them up; but

those holes did not cause much sickness in Mauritius, because they did not breed the anophelines. The same remark applied to land crabs and their holes. In Mauritius it was found to be only the big marsh which caused malaria, not a few pots full of water. It was true that the anophelines bred in small collections of water, but for an outbreak it was necessary that there should be many such small collections of water. In Mauritius a careful observation was kept of the rate of fall in the disease at different distances from a marsh. A few yards from the marsh the spleen involvement rate was 95 per cent. ; a few hundred yards away the rate fell quite rapidly, and further away it was as low as 30 per cent. or less of the children. The question of circumvallation was a very important one. With regard to the use of petroleum, he did not think it was worth while spending much on that for malaria ; drainage was best. Labour could be best employed in clearing waters and draining. He agreed with Dr. Watson's statement that engineers were sometimes very troublesome in connection with operations such as had been described. There were many other points, all of great interest to him, on which he could talk for a long time, but the hour was late, and he must forbear.

Sir FREDERICK TREVES, in reply, said : With regard to the tree question, he asked Major Ronald Ross whether such a tree as the Madagascar or traveller's palm was not a serious breeding ground for the anophelines and other mosquitoes. When he, Sir Frederick, was in Trinidad there was an outbreak of yellow fever there, and that tree was thought by some to play a possible part in it. In their radical measures the Americans realized that there were other collections of water besides those on the face of the ground in which mosquitos might breed. Colon presented the additional difficulty that the swamp in some places was below the sea level. The Americans had another advantage in their sanitary work which was exceptional, *i.e.*, the privilege of what was called "dumping." The enormous mass of earth taken from the cutting could be dropped into the swamp. Thus the swamp at the back of Colon, which could hardly be drained, was being closed by being made a dumping place.

Colonel MACPHERSON, in continuing the discussion, gave some interesting and rather new facts about the subject of the paper, and said his excuse for doing so must be that he returned from Panama only last month, after studying, with Colonel Gorgas, the subject of Sir Frederick Treves's lecture. The reader mentioned that the Commission on Sanitation had absolute powers from the commencement of the work, but that was not so. Colonel Gorgas came from Havana, where he had extinguished yellow fever, in the year 1901, in eight months. He came to Panama, where, to his astonishment, he found it took two years to blot out the disease. He told Colonel Macpherson that the probable reason for that difference was that when he started the campaign in Havana he had the advantage of two years of previous sound sanitary work and organization in the city, whereas in Panama he had to start at the beginning, and had had very great difficulty in obtaining necessary supplies and authority to carry out thorough sanitary measures, even from the people who ought to have supported him. The chief engineer, the Governor,

and the chairman of the Canal Commission had all joined in a recommendation that Colonel Gorgas's work should be discontinued—they said it was not practicable, or at any rate could not be put into practical execution. The object-lesson pointed by the facts was that what Colonel Gorgas had set himself to do was practicable, and that it was the result of determining to triumph over obstacles. He was sure that a remark contained in a letter of Colonel Gorgas's to him, namely, that "successes on these lines would make the work of future sanitarians easier," was one which all would agree with. He (the speaker) had carefully studied the cost of such work, and it was not so great as would be imagined. Colonel Gorgas received \$2,000,000 for extinguishing the disease in that zone, and that included all the hospital work for the treatment of the sick, as well as measures for the prevention of disease. The amount spent in actual prevention was only \$500,000 per annum. That worked out at an insurance of $2\frac{1}{2}$ per cent. on the estimated cost of the canal for preventive work alone. Another interesting point about the sanitation at Panama was that it was despotic hygiene. President Roosevelt had told him that he could not get the same results in the best cities of the States as he could in Panama, simply because of that system of despotic hygiene. What Sir Frederick said about the punishments meted out to those who had larvæ in their houses seemed surprising, but it was perfectly true. In Colon, occupiers of houses were fined 50s. if larvæ were found in the houses, but the same man had never to be fined twice. In regard to pneumonia, Colonel Gorgas had appointed a commission of medical officers and inspectors of health to go into that, and they studied the subject very thoroughly. Only one fact seemed to be established, namely, that negroes who got pneumonia always did so within three months of coming to the Canal Zone, and this pneumonia seemed to be the general sequel to attacks of a catarrh of the respiratory passages of the nature of influenza. The draining of the swamps, so as to get rid of malaria, was the chief trouble in the zone at present. Colonel Gorgas adopted the means shown in Dr. Watson's photographs, namely, draining along the contours—not along the centre—and in order to minimize the cost of keeping drains clear he had begun to lay agricultural drains along the line of drainage trenches, covering them with loose stones and clinkers. The anopheles would not grow unless there was vegetation along the banks of the streams, drains, or pools, and no vegetation grew where this method was adopted.



